WSDOT

Electronic Engineering Data Standards

July 2006

Washington State
Department of Transportation

1 Introduction

The *Electronic Engineering Data Standards Manual* defines standards and procedures for preparing, delivering, and archiving electronic engineering data created for the Washington State Department of Transportation (WSDOT) during location survey, design, and PS&E phases of highway projects. These standards shall be used in the preparation and delivery of all electronic deliverables defined within, and they apply to projects delivered by WSDOT staff and consulting firms, unless otherwise approved by a WSDOT Project Development Engineer.

The purpose of these standards and procedures is to promote uniformity and consistency across WSDOT so that project data can be effectively managed during the project development phase and so that it has value for those in future phases, such as construction, who need to make use of electronic data that was originally created by someone else.

The instructions in this manual are not intended to preclude judgment of the project manager in the event of special or unique circumstances that would make following these standards less efficient for delivery of a specific project.

This manual will be updated on a continuing basis, with revisions issued periodically. The current version will be available electronically on the WSDOT CAE web site. Suggestions for improvements are welcome. Please send any comments or suggestions to your local WSDOT CAE Coordinator.

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2 Data Transfer, Review, and Acceptance

2.1 Introduction

Section 2 defines requirements for the transfer, review, and acceptance of WSDOT electronic data deliverables. The requirements include what information is to be transferred, who is expected to provide the information (the supplier), who will receive the information (the customer), and who will approve the information.

Department suppliers refer to persons directly employed by WSDOT. Consultant suppliers refer to consultant firms hired to provide engineering services for WSDOT.

Following are several examples of electronic data transfers:

- A WSDOT Survey Group or consulting firm (the supplier) provides a InRoads survey dataset to a Design Group or consulting firm (the customer) for use in the design of a project.
- A Design Office or consulting firm (the supplier) provides an InRoads Design dataset to a Construction Office (the customer) for use during construction of a project.
- A consulting firm (the supplier) provides a InRoads dataset and MicroStation PS&E dataset for Stages I & 2 of a project to the WSDOT Headquarters (HQ) Design Office for use during Stage 3 of a project.

While this list is not all-encompassing, it does give examples of some of the electronic data transfers throughout the project development process.

2.2 Preparation and Transmittal of Electronic Data

Requirements for the submission of electronic data are as follows:

- The supplier shall provide the customer with the information in electronic format as described in the appropriate section of this document.
- Consultant suppliers shall submit files through the WSDOT office administering their contract. The WSDOT office receiving the data may ask WSDOT CAE Support to assist in reviewing any electronic data set for compliance.
- WSDOT suppliers shall submit files to department customers by making the electronic data available on a WSDOT network resource that is common to both parties and notifying the customer of that location.
- All electronic files shall be checked for computer viruses by the supplier immediately prior to submission. The supplier shall include a dated log file and a written verification of this virus check. The verification will include the name and version of the virus check software used and the date the virus check was performed. Files found to contain viruses will not be accepted.
- For every deliverable, a transmittal letter to the customer shall be prepared in Word format. This letter shall include the following:
    - ☐ Project information including name, project numbers, and description.
    - ☐ A submission number and date (e.g., Submission #1, 12/22/2004). Revisions shall be submitted under the original submission number and include a revision number and revision date (e.g., Submission #1, Revision #1, 1/7/2005).
    - ☐ The checklist appropriate for the product(s) being delivered as defined in this document.
    - ☐ A contents listing and location of the electronic data being transferred.
- All electronic data submissions shall be compatible with the current versions of CAE software in use by WSDOT as defined in the Level Playing Field standards.
- In general, all submissions shall be in accordance with the standards detailed in the current version of this document. However, with approval from WSDOT, consultant suppliers may submit electronic files that conform to previous versions of this document. The files must be compatible with WSDOT current CAE software standards. Written approval must be obtained from WSDOT in regard to the WSDOT electronic data standards that the consultant supplier is using for the submission. Requests for approval to use

previous versions of WSDOT standards shall be directed to and approved by the Project Manager/Consultant Liaison as applicable.

- The supplier shall ensure that the contents of all electronic files are the same as any “hard copy” information submitted (e.g., survey notes, paper plots, scanned images, or PDF files).
- The supplier shall name the files as stated in the appropriate section of this manual.

2.3 Acceptance of Electronic Data Submittals

2.3.1 All Files

The supplier is responsible for adherence to all standards and should use the same methods and guidelines as the customer to evaluate conformance prior to submittal.

The customer shall use the following guidelines in the evaluation of all electronic files:

- The customer may review and comment on the information submitted by the supplier to ensure conformance with WSDOT standards.
- The customer will run a virus check on every submittal prior to any other review. If a virus is encountered, the submission will be returned immediately and the supplier will be notified about what virus was found and what software package was used to discover it.

2.3.2 Drafting Files

The customer shall use the following guidelines in the evaluation of graphics files:

- Graphic files may be reviewed on a level-by-level basis to ensure adherence to WSDOT standards as described in this document, the *WSDOT* *Plans Preparation Manual* (PPM) and the *CADD Standards for MicroStation using Expanded Levels* supplement.
- Graphic elements may be analyzed using commands within MicroStation for conformance with the prescribed level, size, weight, style and other designated attributes.
- The customer may check submitted files for inconsistencies by reviewing tie points, stationing and dimensioning to ensure accuracy and consistency with the design data generated by other applications used on the project.

2.3.3 Survey Files

The customer shall use the following guidelines in the evaluation of survey files:

- The customer may review the data files for compliance with current WSDOT standard feature code usage.
- The customer may verify that the coordinate ranges are consistent with the project coordinate system including Northing, Easting, and Elevation values.
- The customer may verify that the calculation and application of the combined factor used are correct.

2.3.4 Surface Models

The customer shall use the following guidelines in the evaluation of Digital Terrain Models (DTMs):

- The customer may display features to look for inconsistencies between features in the DTM surface and elements shown in corresponding MicroStation base/proposed mapping files.
- The customer may generate contours and look for inconsistencies or anomalies.
- DTMs may be viewed from several view rotations (including isometric, front, and side views) to identify elements at incorrect elevations. Elements at incorrect elevations are not acceptable.
- The customer may generate profiles along the approximate centerline of all major roads and streams. The customer will review the profiles for unusual slopes and/or breaks.
- The customer may generate cross sections from the approximate centerline of all major roads and streams. Cross sections will typically be done at 10-foot intervals in most areas, and 1-foot intervals in

the vicinity of bridges and culverts. The limit of each section will be the approximate limit of survey. These sections will be reviewed for unusual slopes and/or breaks.

- The customer may display the triangles in a file to ensure that erroneous triangles have not been included.
- The customer may verify surface elevations using methods consistent with the accuracy attainable by the original method of collection.

2.3.5 Alignment Files

The customer shall use the following guidelines in the evaluation of any alignments provided:

- The customer may display the alignments and coordinate geometry points in the design application to verify that they appear in the correct location in relation to the topography.
- The customer may generate InRoads/CAiCE report files based on the alignments and coordinate geometry points and compare them against the survey notes or plans submitted by the supplier for accuracy.

2.3.6 ASCII Files

The customer may review ASCII files to ensure they are in a format consistent with the file content.

2.4 Rejection of Electronic Data Submittals

Any data or files submitted that do not meet the requirements outlined in this document shall be returned to the supplier for correction. With the return of any data or files, the customer will provide a written explanation of all areas that do not conform to this document. The supplier shall be responsible for finding the source of the errors, correcting the errors, and resubmitting the files.

Any contacts between a consultant supplier and WSDOT will be done through the Project Manager or Consultant Liaison as applicable.

3 Project Directory Structure

3.1 Overview

The WSDOT standard project directory structure discussed in Section 3 is intended to consolidate all of a project's electronic files in one folder structure. Survey, design, drafting, and other support files will be located in this structure on a common computer resource for access by all project team members. This consolidated directory structure will simplify archiving project data in a consistent manner and facilitate future retrieval.

Typically, the project lead designer will create the standard project folder structure when creating a new project, and place it on the common network location for access by all stakeholders. WSDOT provides a project creation utility that automates the standard folder structure creation as well as setting up many of the other standards and files in this document. This utility is available in the cae_rsc\common folder and via the startup dialogs on all internal WSDOT workstations. It is also included in the resources for all WSDOT CAE applications (again under cae_rsc\common) for external customers. WSDOT projects should always be created with this project utility.

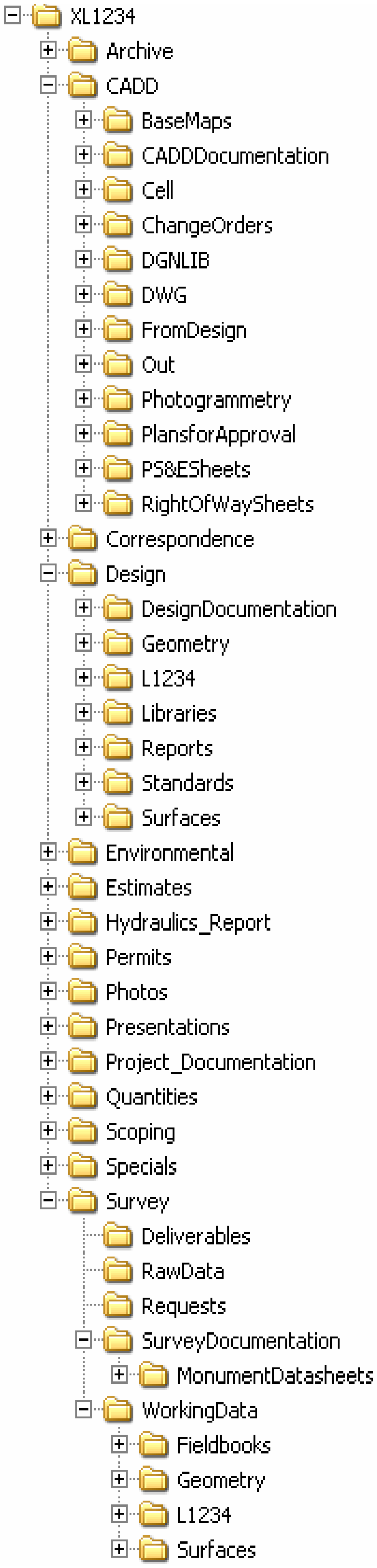
Although a working copy of this structure may reside on a local computer hard drive (e.g., field survey crew laptops), the master files should always be stored in the standard directory structure and the final deliverables must be delivered in the standard project directory structure.

Figure 3-1 is an expanded view of the standard project structure.

Each project is stored in a folder named for its unique WSDOT project ID (XL1234, OL4567, L2005).

In each project folder structure, there are three specific folders for WSDOT standard design applications. These folders are **CADD**, **Design**, and **Survey**. These three folders must remain intact, although subfolders may be added to them It is recommended that no more than two additional levels be added to any folder beneath CADD, Design or Survey. The total number of nested folders anywhere in the project structure *must not exceed eight* to ensure compatibility with backup and data transfer media such as CD-R.

In addition to the three required project folders, each project structure may include additional folders that aid in organizing related project files in a consistent and logical manner. Subfolders may be utilized as needed in these folders. The WSDOT CAE standard project created by the Create Project Utility includes the following additional folders: **Archive**, **Correspondence**, **Project_Documentation**, **Environmental**, **Estimates**, **Hydraulics_Report**, **Permits**, **Photos**, **Presentations**, **Project Documentation**, **Quantities**, **Scoping**, and **Specials**. These are suggested folders and they may be deleted or added to as needed.



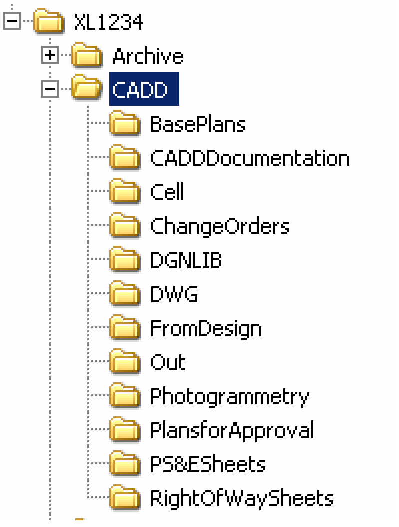
Standard Folder Structure
Figure 3-1

3.2 Required WSDOT CAE Standard Project Folders

The following sections include a more detailed description of requirements for the required WSDOT standard project folders **CADD**, **Design**, and **Survey** .

3.2.1 CADD

The CADD directory is the primary location for drafting files. This directory consists of the following required subfolders:



Standard CADD Folder Structure
Figure 3-2

BasePlans – For all base plan files.

CADDDocumentation – For all drafting-related documentation including file indexes, journals, and filter and user level usage.

Cell – Location for project-specific cell libraries.

ChangeOrders – Change order DGN files are stored in this folder.

DGNLIB – Location for the project-specific DGNLIB file.

DWG – Location for DWG and other AutoCAD files.

FromDesign – Files from InRoads or CAiCE designers for access by drafters. This folder should only be used as a posting point for transmitting/receiving files from design to drafting.

Out – Specified in the WSDOT configuration as the output location for files by certain drafting operations such as exports and translations.

Photogrammetry – Location for storing original or backup versions of photogrammetry files. This folder might include the 3D contour files supplied by Photogrammetry, and other intermediate files created as part of the process of incorporating the photogrammetry data into the project base plans.

PlansForApproval – For completed plans awaiting approval such as channelization plans, supporting drawings for permits and so on.

PS&ESheets – Sheet files for Plans, Specifications, and Estimates (PS&E). Sheet files in this location will be stand-alone or will reference base plan data from the BasePlans folder.

RightOfWaySheets – Sheet files for Right of Way. Sheet files in this location will be stand-alone or will reference base plan data from the BasePlans folder.

3.2.2 Design

All InRoads and CAiCE design-related project files will be stored in the Design folder structure.

3.2.2.1 InRoads Design Projects

The InRoads project structure consists of:

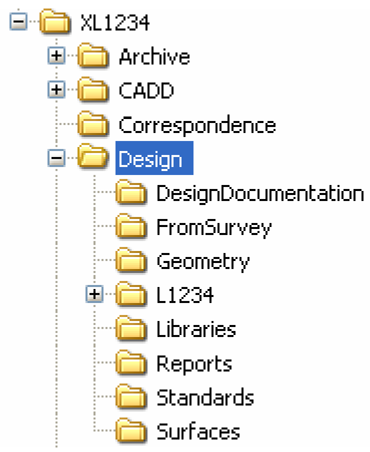


Figure 3-3: Standard InRoads Folder Structure

Project Files (*.rwk) generated will be located at the same level as the parent project folder.

DesignDocumentation – For all design application-related project documentation including journals, element indexes, Design-generated project datum reports, etc.

FromSurvey – Files pulled temporarily by the designer from the Survey folder for review/analysis. This is a working location for designers and not a survey deliverable location.

Geometry – All design Geometry Project (*.alg) files will be stored in this folder.

L1234 – CAiCE Data folder - See Section 3.2.2.2

Libraries – All project-specific roadway template libraries will be stored in this folder including Typical Sections (*.tml), Template Libraries (*.itl), and Roadway Definitions (*.rwl, *.ird).

Reports – All design-generated output reports including XML reports, BIN reports, and any ASCII-formatted reports (*.txt, *.rpt, and others) will be stored in this folder.

Standards – All applicable current WSDOT standard references (found in C:\CAE_rsc\InRoads\INIFiles) will be copied to the Standards folder and prepended with the project name. This will create project-specific preferences (p1234_civ_wsdot.ini), styles (p1234_geo_wsdot.ini), survey feature tables (p1234_survey_wsdot.fwf), survey preferences (p1234_survey_pref_wsdot.fxp), and the WSDOT standards file (p1234_wsdot_standards.xin – version 8.7 and later), which will be stored in this folder and used in the project's design.

Surfaces – All design-generated surface (*.dtm) files will be stored in this folder.

3.2.2.2 CAiCE Design Projects

All CAiCE projects will be created by the WSDOT Create Project Utility or through CAiCE's Project Manager. The CAiCE project should be created in the **Design** subfolder and or the **Survey** project folder (see Figure 3-4). There are two possible locations since both the surveyor and designer may need a dedicated CAiCE project.

The **Design** and **Survey** folders may contain multiple CAiCE projects. All CAiCE projects will be located at the same folder level. No two projects will have the same name.

If possible, the CAiCE project should be given the same name as the master project directory, but in all cases must be 5 characters or less and start with an alpha character. These requirements will sometimes necessitate the dropping of the leading "O" or "X" on some project names as shown in Figure 3-4.

Designers and surveyors should make a copy of the entire CAiCE project folder on the hard drive if working on the project locally rather than directly from the server. After the completion of any local work, the modified CAiCE project folder will be copied back to the network location in its entirety overwriting the previous file set.

Folders that are used in conjunction with a CAiCE project include:

DesignDocumentation – All the required documentation for the CAiCE project. Project journal, Project database documentation, and DTM history files will all be stored in this folder, as well as any other documentation pertinent to the project.

projname – This is the main CAiCE project folder as created by CAiCE's Project Manager. The majority of files in this folder will be files that CAiCE creates on its own for its internal use. This includes the main file set initialized when a CAiCE project is created. The original files created by CAiCE have the same name as the project with varying extensions and should not be modified or moved by the user. Files related to DTMs have the same name as the DTM with varying extensions and, again, should not be modified or moved by the user.

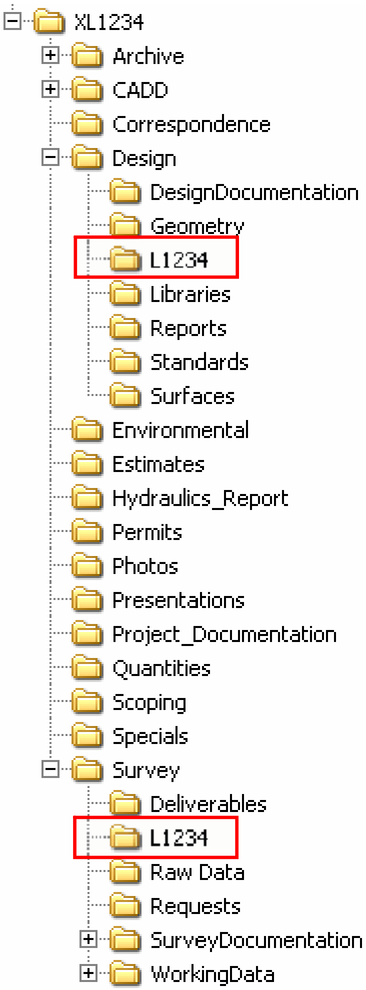


Figure 3-4: Standard CAiCE Folder Structure

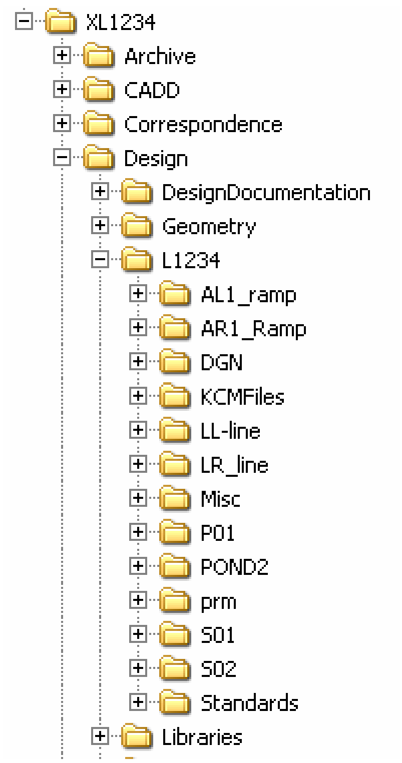
Many or the files created when using CAiCE can be organized into subfolders beneath the main project folder to make them easier to find and access. In general when a Save As option is displayed when creating a CAiCE file, the file should be saved to the appropriate subfolder, not the main project directory. Subfolders to the main project folder are described below and shown in Figure 3-5.

> ***Projname*\C01, C02, S01, S02…**These are the segment folders as generated by the original location survey of photogrammetry. These folders are the individual segment folders generated by CAiCE as data is imported into the projects through Segments. Segments containing survey data should retain the names and data as generated by survey. Each segment must have an entry in the CAiCE project data documenting the segment data's source, traverse notes, backup data locations and datum
>
> Use the following naming scheme when creating your segments. Names must be limited to 3 characters:

C01, C02, C03…	**C**ontrol traverse segments
DM1, DM2, DM3	CEAL application **DM**M segments
P01, P02, P03…	**P**hotogrammetry segments
S01, S02, S03…	**S**urvey segments
T01, T02, T03…	**T**opography segments
TR1, TR2, TR3…	Survey control **TR**averse segments
All other prefixes	Available for other surveys

***Projname*\LL_line, LR_line, POND2…**These are the Alignment, Pond, and Bridge subfolders which contain individual portions of the design. Features that may require separate folders are main line, alignments both minor or sideline, ponds, and bridges. The idea is that the files that relate to specific features being designed are organized for easy retrieval. Typical files placed in these folders are:

CDG	CAiCE Drawing Graphics Files
CLP	DTM Clip Polygon Files
EAR	Base Cross Section and Design Cross Section Files
ERP	Endarea Report Files
ER2	Advanced Endareas/Volumes Exception Station Data Report
LIS	List Files
LOG	Log Files
PF$	Terrain Profiles
RPT	Report Files
SRV	Survey files created when converting endareas to surfaces
STK	Staking report files created when converting endareas to surfaces
TBL	Alignment Specific Tables (e.g., Earthwork Classification Table)
VRB	Design VRS Backup Files
VRD	Design Template Files
VRS	Design Files
X#%	Edit Area Attributes Manual Material Envelope Definition
XCP	Advanced End Areas/Volumes Exception Station Details
XLS	Excel Spreadsheet Files



Standard CAiCE Project Subfolders
Figure 3-5

***Projname*\DGN** – MicroStation files created specifically for use with CAiCE. These may be background image files (such as historical files, quad maps, and so on), snapshots of PS&E files, or specially created MicroStation files for use in import/export operations. Note that active MicroStation files being created in support of the PS&E package are to be stored in their correct locations per the CADD data organization standards in Section 3.2.1.

***Projname*\KCMFiles** – Backup and transfer KCM files.

***Projname*\MISC—Miscellaneous subfolder** – Designer-created files that do not specifically relate to a single horizontal alignment. Files typically placed in this folder are shown below. Also this folder could include files that would typically be in the Alignment folders but are common to multiple alignments:

CDG	CAiCE Drawing Graphics Files
DGN	Trim Mapping Background Image Files
DOC	Word Documents
INI	Parameter Files
FTB	Project-Specific Feature Table

LIS	List Files
LOG	Log Files
RPT	Report Files
RTF	Rich Text Format Documents
TBL	Tables (e.g., Non-Alignment-Specific Earthwork Classification Table)
TPR	Report Files
TXT	Text Files
XLS	Excel Spreadsheet Files

***Projname*\PRM –** Parameter files used within a CAiCE project. The original set of parameter files are created in this location automatically and this folder is the default location to save new parameter files. If certain parameter files pertain to specific alignments or other specific features of the design, make sure each file name reflects its usage. This folder will contain all the parameter files for all alignments.

***Projname*\STANDARDS –** Project-specific resource files such as a feature table, super calculation tables, or special fragments**.**

3.2.3 Survey

All survey files will be stored in the following Survey structure (see Figure 3-6).

Deliverables – Complete-to-date survey dataset(s) formatted for use in design.

RawData – All raw field survey data (*.crd, *.rw5, *.sdr) files will be stored here.

Requests – A copy of the survey request form will be stored and maintained in the project's Survey\Requests folder.

SurveyDocumentation – For all survey application-related project documentation including Survey-generated project datum reports, reports from processing of raw data, traverse analysis and adjustment reports, etc.

SurveyDocumentation\Monumentation – All project monumentation datasheets will be stored here.

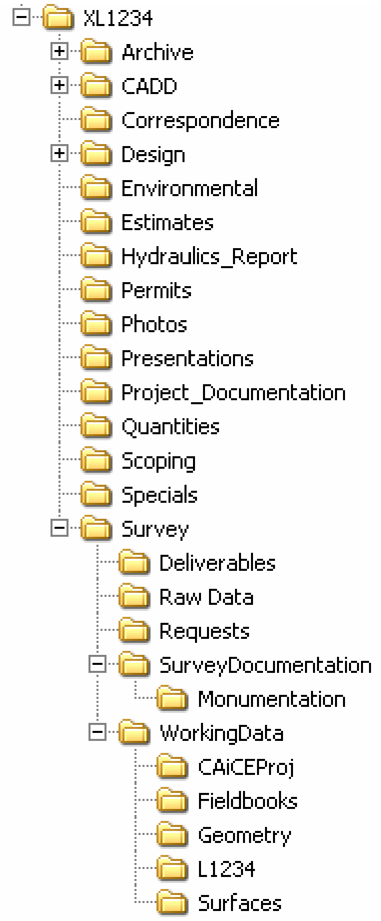
WorkingData – This folder contains all the surveyor's working data and is accessed by the surveyor only.

WorkingData\Fieldbooks – All survey fieldbook (*.fwd) files will be stored in this folder.

WorkingData\Geometry – All survey Geometry Project (*.alg) files will be stored in this folder.

WorkingData\[L1234] – Survey-specific CAiCE project.

WorkingData\Surfaces – All survey-generated surface (*.dtm) files will be stored here.



Standard Survey Subfolders
Figure 3-6

4 File Naming Conventions

Standard naming conventions make the data much more portable so that all users can easily recognize and use the files created by others. In addition the conventions described in this section also facilitate listing files in a logical order and provide information on the file contents at a glance.

Section 4 contains information on the file naming requirements for various files included in WSDOT electronic engineering data. These standards are mandatory components of designing a WSDOT project.

4.1 Survey File Naming Conventions

KEY:

- *Italics* indicate user-defined file name sections using the conventions described below.
- **Bold** indicates mandatory file name sections.
- Each file name section is separated by an underscore (_).

P1234 = Project charge number (*XL1234, C2005*) dropping the leading "X" or "O" for CAiCE design
YYMMDD = Date downloaded, as in *060118* (2006, January 18)
PCid = Party Chief's last name and first initial (*HillC*) no spaces
Desc = Brief, 10-character or less descriptive word indicating main content of file
For example:
BridgeSite = bridge site data
Topo = general topography
Traverse = Control network traverse
WetLands = wetland survey
S## = CAiCE survey segment name (*S01*)
Segmentlist = Listing of survey segments included (*S01_S03-S10_T12-T15*)

4.1.1 Data Collection Files

File Name	Type	Contents
Allegro		
P1234_YYMMDD_PCid_desc.**crd**	ASCII	SurvCE control point list file
P1234_YYMMDD_PCid_desc.**rw5**	ASCII	SurvCE survey data collector file
P1234_YYMMDD_PCid_desc.**dc**	ASCII	Trimble survey data collector file
Sokkia		
P1234S##.**sdr**	ASCII	SDR-33 survey data collector file
*P1234_YYMMDD_PCid_desc.**	ASCII	Generic ASCII text file compatible with InRoads import utilities where (*) indicates an appropriate file extension

4.1.2 Processed Field Survey Files

File Name	**Type**	**Contents**

InRoads

P1234_ PCid_desc.**fwd**	ASCII	InRoads survey fieldbook including edited survey observations
*P1234_ PCid*_**TRAV.xml**	XML	InRoads traverse report file
P1234_ PCid_desc.**dat**	ASCII	InRoads survey traverse adjustment file

*P1234_PCid*_**Control.alg**	ALG	InRoads survey geometry file for control points
*P1234_ PCid*_**Survey.alg**	ALG	InRoads survey geometry file for surveyed features
*P1234_ PCid*_**Survey.dgn**	DGN	MicroStation graphics file containing all surveyed features with all associated information written to the file
*P1234_ PCid*_**Survey.dtm**	DTM	InRoads survey geometry file for surveyed features
*P1234_ PCid*_**Survey.log**	ASCII	InRoads survey fieldbook audit trial file
P1234_Survey_WSDOT.fwf	ASCII	Project-specific InRoads survey feature table
P1234_Survey_Pref_WSDOT.fxp	ASCII	Project-specific InRoads survey preferences file

CAiCE

P1234_Segmentlist.**kcm**	KCM	CAiCE data file including survey information
P1234.**ftb**	FTB	Project-specific feature table used

4.1.3 Researched Survey/Cadastral Files

File Name	**Type**	**Contents**

InRoads

*P1234*_**ROW_Existing.alg**	ALG	InRoads survey geometry file for existing ROW and property lines (not to be generated exclusively from field work)
*P1234*_**ROW_Design.alg**	ALG	InRoads proposed ROW geometry file
*P1234*_**ROW_Existing.dgn**	DGN	Existing survey ROW geometry in MicroStation format

CAiCE

*P1234*_**ROW.kcm**	KCM	CAiCE Right of Way geometry file

MicroStation

*P1234*_**RW_MonMap.dgn**	DGN	Monumentation Map
*P1234*_**RW_ROS.dgn**	DGN	Record of Survey

4.1.4 Report Files

File Name	**Type**	**Contents**

General

*P1234*_**SPC to PD.rpt**	ASCII	State Plane to Project Datum documentation file
*P1234*_**Survey**_*PCid*_**Doc.xls**	XLS	Excel format survey documentation spreadsheet file
P1234_YYMMDD_PCid_desc.**rpt**	ASCII	Miscellaneous survey job report file

InRoads

P1234_YYMMDD_desc.**coo**	ASCII	InRoads coordinate output of all survey points
P1234_YYMMDD_desc.**fig**	ASCII	InRoads figure listing of all survey figures
P1234_YYMMDD_desc.**rpg**	ASCII	InRoads record plan alignment
P1234_YYMMDD_desc.**sto**	ASCII	InRoads alignment stakeout data
P1234_YYMMDD_desc.**sta**	ASCII	InRoads baseline stationing output file

CAiCE

*P1234_S##*_**Traverse.txt**	ASCII	CAiCE Traverse notes using Segment Manuscript

4.2 Design File Naming Conventions

KEY:

- *Italics* indicate user-defined file name sections using conventions described below.
- **Bold** indicates mandatory file name sections.
- Each file name section is separated by an underscore (_).

P1234 = Project charge number (*L1234, C2005*) dropping the leading “X” or “O” for design

ALname = Main controlling alignment associated with file (*L2005_I90.alg* includes all geometry associated with the I90 alignment)

BRnum = Bridge number identifier as in *405-11E* indicating bridge 405/11E

DRftr = Drainage feature identifier (Ex: *D4-3* Drainage sheet 4 note 3 or *LLRetPond1* First Retention Pond on LL Line)

Layer = Layer name (*B2_Subg.dtm* is the subgrade DTM for the B2 alignment)

Desc = Brief, 10 character or less descriptive word indicating main content of file

For example:

B2_FinStage2 = B2 finished grade for stage 2 (L2005_B2_FinStage2.dtm)
Topo = general topography
Traverse = Control network traverse
WetLands = wetland survey

Surf = Name of surface referenced in report and/or table

4.2.1 Design Files

File Name	**Type**	**Contents**

General

*P1234_***Project Documentation.xls**	XLS	Project documentation file

InRoads

P1234_ALname.**alg**	ALG	InRoads Highway design geometry file by alignment
*P1234_***Existing.alg**	ALG	Alternate design file consisting of all existing geometry
*P1234_***Design.alg**	ALG	Alternate design file consisting of all new geometry
*P1234_***Design.tml**	TML	InRoads Highway design typical section library
P1234_ALname.**rwl**	RWL	InRoads Highway design roadway library
P1234_desc.**rwk**	ASCII	InRoads Highway design project file
*P1234_***Exist.dtm**	DTM	InRoads DTM for original ground
*ALname_***Fin.dtm**	DTM	InRoads DTM for finish grade by alignment
*ALname_***Subg.dtm**	DTM	InRoads DTM for subgrade by alignment
*ALname_***Strip.dtm**	DTM	InRoads DTM for stripping by alignment
ALname_Layer.**dtm**	DTM	InRoads DTM for roadway sublayers other than subgrade
*BRnum_***Deck.dtm**	DTM	InRoads DTM for bridge decks where Brnum = bridge number
*DRftr_***CulFL.dtm**	DTM	InRoads DTM for culverts where DRftr = drainage feature
*DRftr_***Pond.dtm**	DTM	InRoads DTM for pond where DRftr = drainage feature
P1234_Desc.**dtm**	DTM	InRoads DTM for miscellaneous dtms other than those listed. Surface must be described in P1234_Project_Doc.xxx file
*P1234_***civ_WSDOT.ini**	ASCII	Civil preference file for InRoads
*P1234_***styles_WSDOT.ini**	ASCII	Wysiwyg preference file for InRoads
P1234_ALname.**xsc**	ASCII	InRoads Custom Cross Section set

CAiCE

*P1234_***Alignment Geometry.kcm**	KCM	CAiCE data file of all geometry chains and design profiles
*ALname_***Exist.ear**	EAR	CAiCE existing ground X-section
*ALname_***Fin.ear**	EAR	CAiCE finished ground X-section
ALname_Desc.**ear**	EAR	CAiCE misc. X-section
*ALname_***Fin.vrs**	EAR	CAiCE finished ground X-section design file
*ALname_***Fin_EW.tbl**	ASCII	CAiCE earthwork classification Table for roadway excavation and embankment materials

*ALname*_**Fin_SURF.tbl**	ASCII	CAiCE earthwork classification Table for roadway materials
*ALname*_**Fin_WALL#_EW.tbl**	ASCII	CAiCE earthwork classification Table for retaining wall excavation and embankment materials
*ALname*_**Fin_WALL#.tbl**	ASCII	CAiCE earthwork classification Table for retaining wall materials
*ALname*_**Fin.erp**	ASCII	CAiCE endarea quantities report including all associated quantities
ALname_Surf.**doc**	DOC	CAiCE stakeout report where Surf = staking surface included
*P1234*_**Final.zip**	ZIP	CAiCE project archive of cleaned final project

4.3 Plan Preparation (CAD) File Naming Conventions

KEY:

- *Italics* indicate user-defined file name sections using conventions described below.
- **Bold** indicates mandatory file name sections.
- Each file name section is separated by an underscore (_).

FileName format: *P1234*_**FT**_*XXYY*.**dgn**

P1234 = Project charge number (*L1234, C2005*) dropping the leading “X” or “O” for design

FT = Two letter **FILE TYPE** code (see **FILE TYPE Codes** following File Listing)

XX = Two letter **PLAN TYPE** code (see **PLAN TYPE Codes** following File Listing)

YY = Two letter *secondary* **PLAN TYPE** code: this code is used when combining multiple plan types on one file type (see **PLAN TYPE Codes** following File Listing)

Desc = Brief, 10-character or less descriptive word indicating main content of file
For example:
AutoTurn = Turning radius analysis

4.3.1 File Type (FT) Codes

BP	Base Plan
DE	Detail Sheet
NT	Structure Notes
MC	Miscellaneous
PR	Profile
PS	Plan Sheet
QT	Quantity Tabs

4.3.2 Plan Type Codes

AL	Alignment
AP	Approval Plan
BG	Bridges
BU	Building Plans and Details
CN	Contours
CT	Control for Survey
DR	Drainage
DU	Detour Routes and Signing
EC	TESC
EL	Electrical
EM	Environmental Compliance
EU	Existing Utilities
EX	Existing
GS	Grading Sections
IC	Interchange Contour
IL	Illumination
IN	Index
IR	Irrigation
LS	Landscape
MK	Pavement Markings
PV	Paving Plans
RC	Reclamation, Borrow, Pit, Quarry, Etc.
RD	Roadway
RM	Record of Monumentation
RS	Roadway Sections
RV	Record of Survey
RW	Right of Way
SU	Staged Construction
SG	Signals
SN	Signing
SP	Site Preparation
SQ	Summary of Quantities
SS	Signing Specifications
ST	Structures/Minor Structures
TC	Traffic Control Plans
TS	Traffic Systems
UT	Utilities
VM	Vicinity Map
WA	Walls

4.3.3 Example File Listing

File Name	**Type**	**Contents**
P1234 _**BP**_*XX*.**dgn**	DGN	PS&E Base plan of features where *XX* = Plan Type
P1234 _**BP**_*EX*.**dgn**	DGN	PS&E Base plan – Existing
P1234 _**BP**_*RW*.**dgn**	DGN	R/W Base plan
P1234 _**DE**_*XX*.**dgn**	DGN	PS&E Detail Sheet where XX = Plan Type
*P1234*_**DE**_*DRPV*.**dgn**	DGN	PS&E Detail Sheet – Drainage and Paving Details
P1234 _**PR**_*XX*.**dgn**	DGN	PS&E Profile Sheet where XX = Plan Type
*P1234*_ **PS**_*XX*.**dgn**	DGN	PS&E Plan Sheet where *XX* = Plan Type
*P1234*_ **PS**_*XXYY*.**dgn**	DGN	PS&E Plan Sheet where *XXYY* = combination Plan Type
*P1234*_**PS_RW.dgn**	DGN	R/W Plan Sheet
*P1234*_**NT_DR.dgn**	DGN	PS&E Drainage Structure Notes
*P1234*_**MC**_*desc*.**dgn**	DGN	Miscellaneous CADD file with description
*P1234*_**PS_INVM.dgn**	DGN	PS&E Index Sheet and Vicinity Map
*P1234*_**QT**_*XX*.**xls** or *P1234*_**QT**_*XX*.**dgn**	XLS DGN	Summary of Quantities Sheets either in Excel spreadsheet or DGN format
*P1234*_**DGN-Model_Index.xls**	XLS	Index file of all DGN files including models used

5 Survey

5.1 Location Survey

5.1.1 General Requirements

WSDOT is currently transitioning its main design application from CAiCE to InRoads. Until CAiCE is phased out of use completely, the requester must identify the design application that will be used on the project and the surveyor will use that application to process the survey data and prepare the appropriate deliverables. Separate guidance for InRoads and CAiCE is included in this section.

5.1.1.1 Initiating a Location Survey

A location survey is initiated by completion of the Survey Request Form by the Project Manager or designee. Sections 14 in the WSDOT *Highway Survey Manual* has instructions for completing the Survey Request Form and providing supporting information for the survey such as; monumentation information including source files for known monumentation; project datum calculations; and any other project-specific information that may impact the surveyor. Upon receipt of the survey request, the surveyor should verify its completeness and adherence to survey request standards before proceeding.

5.1.1.2 Data Collection and Processing

Both the requester and the surveyor are required to adhere to the procedures for surveying defined in the WSDOT *Highway Survey Manual*.

The surveyor will use the current WSDOT standard feature codes for InRoads or CAiCE to identify field observations. See sections 5.1.3.1and 5.1.4.1 for more information on use of feature codes.

The raw data file generated from field observations must be processed and delivered to the requestor in either InRoads or CAiCE format and comply with the specific requirements defined in Section 5.1.3 (InRoads) or Section 5.1.4 (CAiCE).

5.1.1.3 Data Organization

All electronic project files and data will be organized as defined in Sections 3 and 4 of this manual.

5.1.1.4 Incremental Delivery of Survey Data

When incremental transfer of survey data is necessary, each incremental package should include the entire survey dataset (all survey points and survey chains) collected by the surveyor to date. The requester will then overwrite the survey data in their project with the complete, updated survey dataset.

Each package should include all checklist items that apply to the latest dataset, if different from or in addition to the original package.

5.1.2 Documentation

5.1.2.1 Survey Request Form

The surveyor shall fill out the Surveyor portion of the Survey Request Form as described in Section 14 of the WSDOT *Highway Surveying Manual* and place the completed form in the **Survey\Requests** folder.

5.1.2.2 Project Spreadsheet

A CAiCE Project Documentation Spreadsheet (see Section 8.4) or an InRoads Project Spreadsheet (see Section 8.7) whichever is appropriate must be completed for the project.

The project spreadsheet will be named ***projname*_InRoads.xls** or ***projname*_CAiCE.xls** and will be stored in the **Survey/SurveyDocumentation** project folder

5.1.2.3 Existing Monumentation

Information on existing monuments that are applicable to the survey/project limits will be provided by the designer or collected by the surveyor. This documentation will be included in the final project documentation package in the **SurveyDocumentation** folder of the project directory structure

Monument documentation must include source documentation such as WSDOT Monument Database Report of Survey sheets or county reports of survey documentation. These documents must indicate the monument designation, latitude and longitude coordinates, current legal State Plane Coordinate (SPC) system coordinates (NAD 83/91), current North American Vertical Datum (NAVD 88) elevation (if measured), method of collection, accuracy, units, and scale.

Monumentation documentation will remain in its original format and retain its original name as provided by the source. Monumentation maps may be scanned and the electronic scan treated as the source. PDF is the preferred format for scanned monumentation maps though jpg and tif files are also acceptable.

All existing monuments used in the establishment of the project control network must have documentation as described above and have an entry recorded in the project spreadsheet.

5.1.2.4 Project Control

Documentation on the project's control should be stored in **Survey/SurveyDocumentation**.

All control points for the project must have an entry in the project spreadsheet.

Project control points must have traverse adjustment notes to document the ties with primary control monumentation, boundary monumentation, section corners, project control, and any other points included in development of the project control network.

Traverse documentation shall be compiled in either an ASCII text or Microsoft Office-compatible format and shall be named *projname_segname_description*.

Example:

L1234_Traverse documentation.txt

Project control points should be named using an alpha-numeric three-digit numeric value representing the documented source designation. When entering these points into InRoads or CAiCE, the designation should be typed into the point description field along with the referenced State Route (or other street designation) and milepost. For example:

> The point GP20097-15 was recorded by WSDOT Geographic Services using GPS methods. The name used in the project datum documentation will be **GPS15**. The point will have a description of "**GP20097-15 SR97 MP 24.659**."

Conventional Survey Control Documentation shall include the following data:

- Names and coordinates of known primary control (Project Datum per above) to which traverse ties
- Raw, unedited observations file (or report) as collected in the field
- Horizontal Least Squares adjustment report
- Resultant adjusted coordinates

5.1.2.5 Project Datum

Project datum calculations will be completed per the methodology defined in Chapter 6 of the WSDOT *Highway Survey Manual*. The project datum may be calculated by the designer or the surveyor depending on the project requirements. Where multiple combined factors are required, a map of the project datum areas will be provided and (if necessary) impacted control must be documented. The method and decision path of determining project datum coordinates for impacted control must be included in the documentation.

The State Plane to Project Datum conversion report should be in a universally readable format. ASCII Text, Microsoft Excel, or Word are acceptable formats. This report will be stored in the project network file structure in **Survey/SurveyDocumentation**.

The report should use a projname_description naming convention.

Example:

L1234_State Plane to Project Datum.rpt

5.1.3 Data Processed with InRoads

The surveyor will collect the field data and generate a raw data file. After downloading, the raw data files must be processed. Survey data processed with InRoads shall conform to the format and procedures outlined in Section 5.1.3.

5.1.3.1 Feature Code Use

The surveyor will use the current WSDOT standard codes for InRoads to identify field observations. All InRoads fieldbook feature codes that are used must be in the current WSDOT standard feature table (Survey_WSDOT.fwf). If an observed feature cannot be defined by the standard WSDOT feature table, the surveyor will revise the nonstandard code to a similar standard code and assign a note to the observation point describing the nonstandard feature.

The surveyor may submit feature codes that are not in the WSDOT standard feature table to WSDOT CAE Support for possible addition to the standard code list.

5.1.3.2 Fieldbooks

Raw data files will be imported into InRoads Survey fieldbooks (*.fwd files). Each surveyor should create one fieldbook and import all their data files into it.

Fieldbook audit files (*.log files) will be generated to document modifications and adjustments made to the fieldbook information. This file is initiated using the Tools => Survey Options dialog. Once this dialog has been revised, the survey preferences should be saved.

5.1.3.3 Graphic Files

The final survey planimetrics will be written to graphics to produce a MicroStation DGN file. All survey view options must be selected. This file will be named per Section 4.1.2 and stored in **Survey\Deliverables**.

5.1.3.4 Surface Files

A surface will be created and the final survey fieldbook information will be written to it and reviewed for accuracy. This file will be named per Section 4.1.2 and stored in **Survey\Deliverables**.

5.1.3.5 Geometry Project Files

Two geometry projects will be created.

- A geometry project that contains the control points and monuments used in the survey. This file will be named per Section 4.1.2 and stored in **Survey\Deliverables**.
- A geometry project that contains the complete final survey fieldbook dataset and will be saved to an ALG file in the **Survey\Deliverables** folder. This file will be named P1234_ PCid_Survey.alg.

5.1.3.6 Raw Survey Data

All survey data collected for the project needs to be included in its raw, unedited format. Any modifications or edits prior to import into InRoads must be done on copies of the raw files and noted in the survey documentation.

5.1.3.7 InRoads Survey Package Deliverables

A complete InRoads survey package consists of all the electronic data in the project's Survey subfolder. This folder contains all files and data necessary for the requester to import and use the survey dataset in InRoads, and the supporting documentation for the survey. The items listed below must be included in the correct directories:

\Survey\Deliverables

Completed InRoads Survey Dataset Checklist (see Section 8.3)

Processed survey data in fieldbooks (*.fwd)

MicroStation graphics file

InRoads Surface file

InRoads Geometry Project file

\Survey\Requests

Survey Request Form (with Surveyor's section completed)

\Survey\SurveyDocumentation

InRoads Project Spreadsheet

Project Control & Monumentation Documentation

Project Datum Documents

Control Traverse Documents

\Survey\RawData

Raw survey data files

The Survey\Deliverables folder contains all the electronic data necessary for the designer to use the survey in InRoads. This is the only data that will be used directly in the design phase. Access to the other subfolders under the Survey project folder is necessary for backup and overall project documentation.

5.1.4 Data Processed with CAiCE

The surveyor will collect the field data and generate a raw data file. After downloading, the raw data files must be processed. Survey data processed with CAiCE shall conform to the format and procedures outlined in Section 5.1.4.

5.1.4.1 Feature Table

The surveyor will use the current WSDOT standard Feature Table for CAiCE, (the name should be consistent across all resources) to collect field observations. If nonstandard codes are required to accurately represent features, the standard code Feature Table (WA_0003.FTB) will be copied and renamed to a project-specific code list. Project-specific codes will be included in the renamed feature table.

The surveyor will document the name of the project Feature Table used to collect field information and list the nonstandard codes that have been added.

Project-specific standard Feature Table files will be renamed from the standard "WA_0003.FTB" to projname.FTB where projname is the project name (e.g., L1234.FTB).

When nonstandard codes are used, a text file listing of those codes will be provided with a description for each code in the form.

Example:

Non-std code	Description
DIRP	Direction of Pipe
BENCH	Park Bench, Fixed

5.1.4.2 Segments

Segments should be utilized to organize the survey data, as well as to separate individual survey datasets in the project.

The suggested format for naming segments is:

C01, C02, C03…	**C**ontrol traverse segments
DM1, DM2, DM3	CEAL application **DM**M segments
P01, P02, P03…	**P**hotogrammetry segments
S01, S02, S03…	**S**urvey segments
T01, T02, T03…	**T**opography segments
TR1, TR2, TR3…	Survey control **TR**averse segments
All other prefixes	Available for other surveys

The processed survey data shall be compiled in a KCM file and named projname_includedsegments.kcm.

Example:

L1234_S01-S15_TR1.kcm

The above file includes survey segments S01 through S15 and traverse segment TR1.

5.1.4.3 Processed Survey Data

The processed data to be delivered shall be extracted from the surveyor's CAiCE project into a KCM file. The KCM file will always contain all survey data for the project to date.

5.1.4.4 Digital Terrain Model Image

The surveyor shall provide a CDG image file representing the complete surveyed terrain surface (Digital Terrain Model) to the requester for topographic survey projects. This file provides a graphical check of the survey dataset after the requester has included the information in their project. Supplemental images are acceptable, but the final and complete survey dataset will be represented by a final CDG file.

To create a CDG file in CAiCE, clear the graphics screen. View the DTM surface. Select **File => Save => CDG**.

The CDG file shall be named projname_surface_DTM_segments.

Example:

L1234_EXIST_DTM_S01-S15_T01.CDG

The above file is a graphic image of the EXIST DTM surface that was developed using survey segments S01 through S15 and T01.

5.1.4.5 Raw Survey Data

All survey data collected for the project needs to be included here in its raw, unedited format. Any modifications or edits prior to import into CAiCE must be done on copies of the raw files and noted in the survey documentation.

5.1.4.6 CAiCE Survey Package Deliverables

A complete CAiCE survey package consists of all the electronic data in the project's Survey subfolder. This folder contains all files and data necessary for the requester to import and use the survey dataset in CAiCE, and the supporting documentation for the survey. The items listed below must be included in the correct directories.

\Survey\Deliverables

Completed CAiCE Survey Dataset Checklist (see Section 8.2)

Processed survey data in KCM file format

Project-specific Feature Table and documentation (if one was created)

CDG file of DTM surface

\Survey\Requests

Survey Request Form (with Surveyor's section completed)

\Survey\SurveyDocumentation

CAiCE Project Documentation Sheet

Project Control and Monumentation Documentation

Project Datum Documents

Control Traverse Documents

\Survey\RawData

Raw survey data files

The Survey\Deliverables folder contains all the electronic data necessary for the designer to use the survey in CAiCE. This is the only data that will be used directly in the design phase. Access to the other subfolders under the Survey project folder is necessary for backup and overall project documentation.

5.1.5 Project Closure and Transition

5.1.5.1 Delivery of Final Package

General requirements for the transfer, review and acceptance of the data are detailed in Section 2.

The surveyor will prepare a complete survey package as described in Sections 5.1.3 (InRoads) or 5.1.4 (CAiCE) by preparing all the appropriate electronic information in the **Survey** subfolder and notifying the requestor that the survey has been finalized.

On projects with multiple surveys delivered independently, each set of files prepared for design will either be in its own zip archive or its own subfolder within the **Survey/Deliverables** subfolder. Each separate design file set will include the submittal/revision number in its zip filename or subfolder.

Delivery can be accomplished by providing the requester access to the entire Survey folder if both surveyor and requester share a network resource and can both reference the same project folder.

If a shared network location is not an option, the surveyor will provide the requestor with a copy of the project's Survey subfolder. This can be accomplished using any medium that can reliably contain the entire folder structure. (e.g., an email, an FTP site, a compact disk or a DVD).

5.1.5.2 Data Archival

On projects where the surveyor is internal to WSDOT, it is the surveyor who is responsible for archival of the final electronic survey data per the region's policy for archival of electronic project data. When the surveyor is external to WSDOT, it is the requester who is responsible for archival of the final electronic data per the region's policy.

If no regional archival policy exists, the responsible party needs to ensure the data is appropriately archived for future reference.

6 Roadway Design

Section 6 defines the file organization structure, data formats, and delivery procedures for the electronic engineering data created during a highway design project. These standards are mandatory components of designing a WSDOT project. The designer is responsible for resolving all omissions, deficiencies, and errors in a timely manner to prevent any negative impacts on the construction project schedule.

WSDOT is currently transitioning to InRoads for new highway design projects. There is separate guidance for InRoads and legacy software, CAiCE (which is planned to be phased out of use).

6.1 InRoads Design Data

6.1.1 Data Organization

All electronic project files and data will be organized as defined in Sections 3 and 4 of this manual.

6.1.2 General Requirements

6.1.2.1 InRoads Project Name

Project names shall be limited to eight characters and shall contain no symbols or spaces.

6.1.2.2 InRoads Project Spreadsheet

The InRoads Project Spreadsheet contains pertinent information on the various elements that make up the InRoads project. The InRoads Project spreadsheet is the guide to the project's contents, and provides information on how the various design feature components relate to one another.

The categories documented in the InRoads Project Spreadsheet are shown below. Specifics required for each general category can be seen in the InRoads Project Spreadsheet (see Section 8.7).

- Project Information
- Monumentation information
- Geometry (.alg) Information
- Surface (.dtm) Information
- Libraries (.tml, .rwl) Information
- Resource file (.ini /.xin) Information

The InRoads project spreadsheet will be named ***projname*_InRoads.xls** and will be stored in the **Design/DesignDocumentation** project folder

6.1.2.3 Project Journal

The designer will create and maintain a project journal, which is used as a living document to record the project's design progress. The project journal will provide sufficient detail so that anyone reviewing the project can see the project's evolution. The project journal shall include alternatives considered and the related data locations, documentation on data brought into the project, and details on major design decisions.

The purpose of the project journal is the recording of details related to the final design and the considered alternatives, so that anyone reviewing the project can understand the project's design methodology as it relates to the engineering data. Entries in the project journal should be as descriptive as possible. The project journal is created and maintained in the **Design/DesignDocumentation** folder.

Below are a few examples of project journal file entries though not all potential types of entries are covered. If the designer is making an addition or revision that directly relates to the use of the final design data, it should be documented in the project journal file.

- Any modifications to the project-specific INI file
- Notation on the importation of any new datasets into the project, their sources and any manipulation of the source data (datum transformation, clipping, etc.) performed
- Any change in the project's datum or coordinate system
- General design philosophies used (for instance, it would be noted how the designer broke up the project up into design components and how the design components relate to one another for volume computations).

A Project Journal Template (see Section 8.5) will be copied to the **Design/DesignDocumentation** project folder at project creation. The copied template file will be renamed to *projname*InRoadsJournal.xls. This file is automatically set up when the WSDOT Create Project Utility is utilized or the journal template file can be saved to the proper location and renamed manually.

6.1.2.4 WSDOT Standard Resources

Designers will use the most current WSDOT resources for InRoads including feature styles, super tables, macros and roadway components.

WSDOT InRoads resources are automatically downloaded to all WSDOT computers connected to the network and are updated as needed.

WSDOT provides consultants with a complete set of InRoads resource files in the form of libraries, tables, macros and configuration files. These files are available for download from WSDOT's CAE website at:

http://www.wsdot.wa.gov/eesc/cae/resources

6.1.2.5 Project-Specific Resources

The WSDOT Create Project process automatically copies the necessary civil, geometry and survey preference files into the **Design\Standards** folder, and renames them to include the project name. These copies are the project-specific resource files that need to be used during design, and archived with the project.

WSDOT provides a configuration file comparison utility (cae_rsc\inroads\utilities\IPFSynch.exe) that allows InRoads users to maintain their project and user specific preferences, styles and symbologies and still keep current with standard WSDOT CAE preferences, styles and codes. Designers will use this tool to keep the WSDOT standard portions of the project specific resources in synch with the latest release of the WSDOT resource files each time the standard WSDOT files are updated..

All permanent project elements will have a feature style or geometry style assigned. Design elements should be assigned standard WSDOT feature styles, geometry styles, survey features and transition control names.

6.1.2.6 Descriptions

InRoads commands for creating alignments, roadways, surfaces, templates, etc., include a description field. The designer will use these input fields to describe an element beyond what is required by the element naming conventions described later in this section. Descriptions can contain such information such as alignment references, DTM names, stations, dates, links to other files, etc.

6.1.2.7 Project Datum

Per the *WSDOT* *Highway Survey Manual* a project datum should always be calculated and used for WSDOT data.

Project datum calculations will be completed per the methodology defined in the WSDOT *Highway Survey Manual*, Chapter 6. The project datum may be calculated by the designer or the surveyor depending on the project requirements. Where multiple combined factors are required, a map of the project datum areas will be provided and (if necessary) impacted control must be documented. The method and decision path of determining project datum coordinates for impacted control must be included in the documentation.

The State Plane to Project Datum conversion report should be in a universally readable format. ASCII Text, Microsoft Excel, or Word are acceptable formats. This report will be stored in the project network file structure in **Survey/SurveyDocumentation.**

The report should use a projname_description naming convention.

Example: **L1234_State Plane to Project Datum.rpt**

6.1.2.8 Project Monumentation

Monumentation Maps that are applicable to the survey/project limits will be provided by the designer or collected by the surveyor. This documentation will be included in the final project documentation package in the .**SurveyDocumentation** folder of the project directory structure

Monument documentation must include source documentation such as WSDOT Monument Database Report of Survey sheets or county reports of survey documentation. These documents must indicate the monument designation, latitude and longitude coordinates, current legal State Plane Coordinate (SPC) system coordinates (NAD 83/91), current North American Vertical Datum (NAVD 88) elevation (if measured), method of collection, accuracy, units, and scale. An index file listing each document and its source and contact information is required.

Monumentation documentation will remain in its original format and retain its original name as provided by the source. Monumentation maps may be scanned and the electronic scan treated as the source. PDF is the preferred format for scanned monumentation maps though jpg and tif files are also acceptable.

6.1.3 Requirements for Specific Data Types

There are many InRoads database elements and files required to complete the design project. Those that have specific requirements are detailed throughout this section.

6.1.3.1 Survey Data

Surveyed data is assigned InRoads feature styles by virtue of the translation process between field survey feature codes and InRoads civil configuration settings.

All features for survey and mapping will be standard as per the WSDOT feature table. The proper assignment of feature will ensure that the ground attribute, color, level, weight, cell, and style will be correct throughout the design process.

The surveyor and designer will make full use of the description field if additional information is needed to describe the element beyond what is required by the naming convention.

6.1.3.2 Geometry Elements

Horizontal Alignment Geometry

InRoads horizontal alignments will have names that match those used within the contract drawings wherever possible. This will ensure consistency between InRoads designs and the resulting contract drawings.

Alternate alignments will have the appropriate prefix followed by the characters "_A" and the alternate's number.

Examples:

LL – LL Line

LL_A2 – Alternate 2 LL Line

LM – LM Line

HPRoad – Highpoint Road

Horizontal Alignment COGO Elements – Points, Curves, Spirals, Spiral Curve Spirals

Point names in the COGO Buffer should be numeric only, due to some special characters that InRoads uses to edit alignments.

Ditch Geometry

Alignments that control ditches will have the prefix of the related horizontal alignment followed by the character "D." An odd number would indicate a ditch to the left of the alignment and an even number indicates a ditch to the right.

Example:

BLN_D1 – First ditch used in the design of the B-Line

LR_D3 – Third ditch used in the design of Alternate 1 of the LR Line

Wall Geometry

Alignments that control walls will have the prefix of the related horizontal alignment followed by the character "_W." An odd number indicates a wall to the left of the alignment and an even number indicates a wall to the right.

Examples:

BLN_W1 – First wall used in the design of the B-Line

LR_W3 – Third wall used in the design of Alternate 1 of the LR Line

Offset Geometry Alignments

Geometry related to the alignment, including all horizontal controlling alignments used in the compilation of the final template will have the same prefix as the alignment and a descriptive component (often an abbreviation of the feature style name is used). Though not a strict standard, it is useful to number the alignments so that odd stations are on the left and even stations are on the right, ideally in increasing order as you move out from the alignment itself.

Examples of Controlling and Offset alignment names:

LL – Controlling alignment

LL_LEN1 or **LL_LaneEdNew1** – Left lane edge new

LL_LEN2 or **LL_LaneEdNew2** – Right lane edge new

LL_LEN3 or **LL_LaneEdNew3** – Left second lane edge new

LL_LEN4 or **LL_LaneEdNew4** – Right second lane edge new

LL_ETWN1 or **LL_EdTravWayNew1** – Left edge of traveled way new

L_ETWN2 or **LL_EdTravWayNew2** – Right edge of traveled way new

LL_SPEN1 or **LL_ShldPavEdNew1** – Left shoulder paved edge new

Right of Way Geometry

The basic naming convention for proposed right of way geometry is to prefix the geometry name with "RW." An odd number indicates an alignment left of the controlling alignment and an even number indicates one to the right. The designer should make full use of the description field if additional information is needed to describe the element beyond what is required by the naming convention.

6.1.3.3 Superelevation

In InRoads version 8.5, the superelevation is a child of the horizontal alignment. The basic superelevation naming convention is to use the name of the controlling alignment name.

In InRoads version 8.7, the superelevation is a process of the Roadway Designer and is associated with a corridor. The superelevation naming convention is to use the name of the primary alignment that is the geometric control for the corridor.

For both versions, if more than one superelevation design is needed for a horizontal alignment, an underbar character followed by descriptive information should be appended to the controlling alignment name.

6.1.3.4 Vertical Alignments

If there is only one vertical alignment associated with a horizontal alignment, it should have the same name as the parent horizontal alignment. When there are multiple alignments associated with a horizontal alignment, the vertical alignments should have an underbar character followed by descriptive information appended to the controlling alignment name.

Examples: for multiple vertical alignments associated with horizontal alignment **LL1**

LL1_DesignSpeed60 – Profile with sight distances calculated for 60 mph

LL1_DesignSpeed50 – Profile with sight distances calculated for 50 mph

6.1.3.5 Design Templates

Template Libraries

During the design phase, multiple template libraries may be utilized, but the final design template library must contain all templates needed for the design of the project. The final template library will be a compilation of each designer's templates, cut/fill tables and decision tables.

In InRoads version 8.5 and earlier, this template library is in the form of a *.TML file. The basic naming convention for a design template file is *projname*_Design.tml. Each template within the library has a descriptive name that indicates the alignment and type of template. Alignment-specific templates should have the alignment included in the name.

In InRoads version 8.7 and higher, the template library format is *.ITL, and the basic naming convention for this template type is the project name as the prefix. Each template folder category within the library has a descriptive name that indicates the component type (lane, sidewalk, structures, etc.) or end condition.

Roadway Definitions

The roadway definition file (RWL) contains specific horizontal and vertical definitions including station ranges, templates, end conditions, vertical and horizontal control elements. Each entry in the RWL file should be named appropriately and descriptively to be able to recreate the design. The roadway definitions will include the alignment name, types and station ranges where unique roadway definitions are required. This roadway definition library is used in InRoads version 8.5 and lower.

In InRoads version 8.7 and higher, the roadway definition is an element of the roadway design, and uses the *.IRD file format for specifying roadway corridors and superelevation specifications. The file naming convention for this library is to use the controlling alignment name as the prefix and the expected surface model (e.g., *AlignName*_**Finish.ird)**.

6.1.3.6 DTM Surfaces

Documentation for DTM surfaces

Documentation for DTM surfaces will be stored in the **Design\DesignDocumentation** folder. The InRoads Project Documentation spreadsheet (see Section 8.7) contains a tab for documenting the surfaces in the InRoads project. All steps necessary to recreate the existing surface from the original data sets will be documented in this file or in separate narrative files. The documentation will include which datasets were used, any transformations necessary and any edits done in design to the original survey data.

Existing Ground Surface

The DTM surface that best models the existing condition for the project will include the name EXIST (e.g., *P1234*_**FinalExisting.dtm)**. Other existing surface models will have descriptive names prepended with "EX." Models that are the result of merged surfaces will have descriptive names prepended with "MERGE."

Finish Surfaces

The DTM surface that best models the finished condition for the project will include the name FIN. Other finished surface models will start with the characters "F." Finished surface layers that are generated by the InRoads Roadway Modeler will include the alignment name, followed by the layer name.

Examples:

LL1_FIN.dtm

LL1_SUBG.dtm

LL1_CSTC.dtm

Other Surfaces

Names of surfaces created for work with staged construction, ponds or other project features will be descriptive and will tie the surface to the design element they represent in the plan set.

6.1.3.7 Cross Sections

Existing and finish ground cross sections will be created in a special design file named *projname*_xsc.dgn. Standard WSDOT cross section preferences should be used. The naming convention for the InRoads custom cross section set text file is *P1234_ALname*.**xsc**.

6.1.3.8 Report Files

The Reports folder will include:

- End-area volumes
- XML alignment reports
- Superelevation transition reports
- Other text reports that describe geometry or surface elements generated during the design process

Designers should use descriptive names that relate directly to the design function performed and the data being used when creating other design-related report files.

6.1.3.9 DGN Design Files

Designers will create a DGN of the final design to graphically document the finished product and make design element retrieval and viewing easier. This practice provides anyone reviewing the data with an easy method to view all design elements related to different components of the final design.

6.1.3.10 RWK Files

Designers will maintain up-to-date project listing files and file paths in the form of .RWK files. The .RWK files point the InRoads program to the physical location of the project files, including surfaces, typical section libraries, coordinate geometry projects, roadway libraries and preference files. The .RWK files shared between design groups can reference the specific file names only and do not need to include the full path if the referenced files are in the same project folder.

6.1.4 Project Closure and Transition

The following requirements will apply after the designer has prepared all the appropriate electronic information for an InRoads design package as described in Section 6.1.

6.1.4.1 Project Cleanup

The final data set contains the InRoads design data and all supporting information necessary for the customer and/or future designers to understand and use the data in InRoads. All data not necessary for construction of the project or of use to future designers should be deleted. The resulting dataset should contain only the data necessary for the final project design.

To ensure the quality of the engineering data, the following InRoads utilities should be used on the InRoads project prior to compiling the Design and Construction archives.

- The InRoads Remove User Data application add-in removes the GUID that InRoads assigns to the alignment when that element is copied from another alignment. This tool makes the alignment and all copies derived from it into simple graphics.
- The Geometry Utilities Assign Names command cleans up the COGO Buffer by deleting extraneous points and ensuring that each point is assigned. This tool also checks for coincident or duplicate points.
- The Check Integrity commands check horizontal and vertical elements identifying and fixing discontinuities, non-tangencies, transposition, mismatched radii and other issues relating to the geometric integrity.
- The Compress Surface command removes points that are marked as deleted in the surface model, which reduces the size of the model on disk and in memory.

6.1.4.2 Preparation of Archives Subfolder

The following must be provided in the **DESIGN\ARCHIVES** folder:

- Completed InRoads Designer Checklist (for form template and sample, see Section 8.8)
- PostDesign Archive – This archive file should include the final design and all alternatives considered in the design process. It should contain all of the files necessary for a future designer to understand the design and to edit it if necessary. This normally is achieved by including the project's Design folder in its entirety. The PostDesign Archive's name is prefixed with the project name and appended with "_INROADS_POSTDESIGN."
- ForConstruction Archive – This archive is a subset of the PostDesign Archive. It contains only the information from the PostDesign Archive that is needed by the construction office. Generally, this means removing all data relating to considered (but not selected) alternates, to permit applications, or to any other data not specifically needed in the construction of the project. The Construction Archive's name is prefixed with the project name and appended with "_INROADS_FORCONSTRUCTION." The unzipped InRoads project data should be identical to the Construction Archive's contents at the time of turnover to construction.

6.1.4.3 Delivery of Final Package

General requirements for the transfer, review and acceptance of the data are detailed in Section 2.

Delivery will be accomplished by providing the customer access to the project folder if both the designer and the customer share a network resource that allows them both to reference the same folder structure. Access to the entire project folder is necessary when transferring interrelated survey, design and CADD data sets. However, if the InRoads design data is independent of other project data relating to CADD and survey, then access to just the Design subfolder is sufficient.

If a shared network location is not an option, the designer will provide the customer with a copy of the final data. This can be accomplished using any medium that can reliably contain the entire folder structure to be transferred (e.g., an e-mail, an FTP site, a compact disk, or a DVD).

6.1.4.4 Data Archival

On projects where the designer is internal to WSDOT, it is the designer who is responsible for archival of the final electronic design data per the region's policy for archival of electronic project data. When an external supplier is providing data to WSDOT, it is the WSDOT customer who is responsible for archival of the final electronic data per the region's policy.

If no regional archival policy exists, the responsible party needs to ensure the data is appropriately archived for future reference.

6.2 CAiCE Design Data

6.2.1 Data Organization

All electronic project files and data will be organized as defined in Sections 3 and 4 of this manual.

6.2.2 General Requirements

6.2.2.1 CAiCE Project Spreadsheet

The CAiCE Project Spreadsheet contains all pertinent information regarding the various database elements that make up a CAiCE project. The CAiCE Project Spreadsheet is the guide to what is in the project, how the various pieces relate to one another, and what the necessary components are for any given design feature.

The major categories of design elements to be documented in the project spreadsheet are shown below. Specifics required for each general category can be seen in the sample CAiCE Project Spreadsheet (see Section 8.4).

- Project Information
- Monumentation Information
- Alignments
- Drainage
- Structures
- Survey Segments
- Surfaces

The CAiCE project spreadsheet will be named ***projname*_CAiCE.xls** and will be stored in the **Design/DesignDocumentation** project folder

6.2.2.2 Project Journal

The designer will create and maintain a project journal which is a living document to record the project's design progress. The project journal will provide sufficient detail so that anyone reviewing it can see the project's evolution. The project journal shall include alternatives considered and the related data locations, documentation on data brought into the project, and details on major design decisions.

The purpose of the project journal is the recording of details related to the final design and the considered alternatives, so that anyone reviewing the project can understand the project's design methodology as it relates to the engineering data. Entries in the project journal should be as descriptive as possible. The project journal is created and maintained in the **Design/DesignDocumentation** folder.

If the designer is making an addition or revision that directly relates to the use of the final design data, it should be documented in the project journal file. Below are a few examples of project journal file entries though not all potential types of entries are covered.

- The creation of a project-specific feature table, its file name, and any subsequent modifications
- The creation of project-specific zones and their uses
- The importation of any new datasets into the project, their sources, and any manipulation of the data done for use with the project
- Any change in the project's datum or coordinate system
- General design philosophies used (for instance, it would be noted how the designer broke up the project up into design components and how the design components relate to one another for volume computations)

A Project Journal Template (see Section 8.5) will be copied to the **Design/DesignDocumentation** project folder at project creation. The copied template file will be renamed to *projname*KCJournal.xls. This file is automatically set up when the WSDOT Create Project Utility is utilized or the journal template file can be saved to the proper location and renamed manually.

6.2.2.3 WSDOT Standard Resources

Designers will use the most current WSDOT resources for CAiCE including feature tables, super tables, macros, and roadway fragments.

WSDOT CAiCE resources are automatically downloaded to all WSDOT computers connected to the network and are updated as needed.

WSDOT provides consultants with a complete set of CAiCE resource files in the form of libraries, tables, macros, and fragments. These files are available for download from WSDOT's CAE web site at:

http://www.wsdot.wa.gov/eesc/cae/

6.2.2.4 Project-Specific Feature Table

The current WSDOT feature table will be copied to the *caice_proj*\STANDARDS folder for use in the CAiCE project. After copying the file, the designer shall rename the table to match the project name.

Example:

Design\L1234\Standards\L1234.ftb – CAiCE project L1234's feature table

All permanent project elements will have a feature assigned. Whenever possible, a feature from the standard WSDOT features will be used. If a project-specific or other nonstandard feature is needed, it will be added to the project feature table and documented in the CAiCE Project Spreadsheet (See Section 8.4).

6.2.2.5 Zone Designations

CAiCE zones are a method of segregating data within a design project. Zones can be set up to facilitate the selection of information for viewing, editing, reporting, etc.

Survey data will automatically be assigned the WSDOT standard survey codes as defined in the feature table. Use of zones with the design data will be determined by the engineer and documented in the Project Database Spreadsheet. Possible scenarios for zone use in design include:

- Classifying data by function using WSDOT Standard Zones. Example: Zone 40 is Drainage, so designer may want to use 41 for proposed ditches, 42 for proposed culverts, and so on.
- Classifying data by design element. Example: All elements related to WALL 1 have Zone 101, elements related to WALL 2 have Zone 102, and so on.
- Classifying data by designer to make multidesigner project collaboration easier. When more than one designer is working on the same project, it may make combining data easier if each designer uses a distinct zone identifier. Naturally, rules would also need to be created that would ensure there was overwriting of data.

The zone schema used and the rationale behind it will be documented in the CAiCE Project Spreadsheet.

6.2.2.6 Descriptions

Most of the CAiCE commands that create database elements provide an input field for a description that will be associated with that element. The designer will use these input fields if additional information is needed to describe an element beyond what is required by the element-naming conventions described later in this document. Descriptions can contain information such as alignment references, DTM names, stations, dates, and links to other files.

6.2.2.7 Project Datum

Per the WSDOT *Highway Survey Manual* a project datum should always be calculated and used for WSDOT data.

Project datum calculations will be completed per the methodology defined in the WSDOT *Highway Survey Manual*, Chapter 6. The project datum may be calculated by the designer or the surveyor depending on the project requirements. Where multiple combined factors are required, a map of the project datum areas will be provided and (if necessary) impacted control must be documented. The method and decision path of determining project datum coordinates for impacted control must be included in the documentation.

The State Plane to Project Datum conversion report should be in a universally readable format. ASCII Text, Microsoft Excel, or Word are acceptable formats. This report will be stored in the project network file structure in **Survey/SurveyDocumentation.**

The report should use a projname_description naming convention.

Example:

L1234_State Plane to Project Datum.rpt

6.2.2.8 Project Monumentation

Monumentation Maps that are applicable to the survey/project limits will be provided by the designer or collected by the surveyor. This documentation will be included in the final project documentation package in the **SurveyDocumentation** folder of the project directory structure.

Monument documentation must include source documentation such as WSDOT Monument Database Report of Survey sheets or county reports of survey documentation. These documents must indicate the monument designation, latitude and longitude coordinates, current legal State Plane Coordinate (SPC) system coordinates (NAD 83/91), current North American Vertical Datum (NAVD 88) elevation (if measured), method of collection, accuracy, units, and scale. An index file listing each document and its source and contact information is required.

Monumentation documentation will remain in its original format and retain its original name as provided by the source. Monumentation maps may be scanned and the electronic scan treated as the source. PDF is the preferred format for scanned monumentation maps though jpg and tif files are also acceptable.

6.2.3 Requirements for Specific Data Types

There are many CAiCE database elements and files required to complete the design project. Those that have specific requirements are detailed throughout Section 6.2.3.

6.2.3.1 Survey Points and Chains

Survey database elements are automatically assigned prefixes that are the same as the feature code when importing the survey data with standard WSDOT procedures.

All features for survey and mapping will be standard as per the WSDOT feature table. The proper assignment of features will ensure that the ground attribute, color, level, weight, cell, and style will be correct throughout the design process.

The surveyor and designer should make full use of the description field if additional information is needed to describe the element beyond what is required by the element-naming convention.

6.2.3.2 Photogrammetry Points and Chains

Photogrammetry database elements can be imported into CAiCE so that the feature is used as the prefix, or so that all photogrammetry elements have the prefix **PH**. The translation table used in the import process controls this option. For large photogrammetry imports, it is recommended to use the PH prefix for all elements so that the data is easily selectable and project prefixes aren't fragmented.

All features from photogrammetry will be standard as per the WSDOT feature table. The proper assignment of features will ensure that the ground attribute, color, level, weight, cell, and style will be correct throughout the design process.

The surveyor and designer should make full use of the description field if additional information is needed to describe the element beyond what is required by the element-naming convention.

6.2.3.3 Geometry Chains

Horizontal Alignment Geometry Chains

CAiCE horizontal alignments will have names that match those used within the contract drawings whenever possible. This will ensure consistency between CAiCE designs and the resulting contract drawings.

A CAiCE horizontal alignment geometry chain has a 10-character limit. Working within this limit, designers will follow these naming conventions:

- Final roadway alignments will have a three character prefix that identifies the alignment. The prefixes used for each alignment will be documented in the CAiCE Project Spreadsheet (see Section 8.4).
- Alternate alignments will have the appropriate prefix appended with the character "A."
- For final alignments, the number portion of the name will always be 1. The number portion of alternate alignments will correspond to the alternate number.

  Examples:

  LL1 – LL Line

  LLA1 – Alternate 1 LL Line

  LLA2 – Alternate 2 LL Line

  LM1 – LM Line

  BLN1 – B-Line

  HP1 – Highpoint Road

Horizontal Alignment Elements – Points, Curves, Spirals, Spiral Curve Spirals

Alignment elements will have the same prefix as the alignment of which they are a part.

Ditch Geometry Chains

Alignment chains that control ditches will have the prefix of the related horizontal alignment followed by the character "D." An odd number indicates a ditch to the left of the alignment and an even number indicates a ditch to the right.

Examples:

BLN1W1 – First wall used in the design of the B-Line

LR1W3 – Third wall used in the design of Alternate 1 of the LR Line

Wall Geometry Chains

Alignment chains that control walls will have the prefix of the related horizontal alignment followed by the character "W." An odd number indicates a wall to the left of the alignment and an even number indicates a wall to the right.

Examples:

BLN1W1 - First wall used in the design of the B-Line

LR1W3 - Third wall used in the design of Alternate 1 of the LR Line

Fragment Hook Chains Related to Alignments

Geometry chains related to the alignment, including all hook chains used in the compilation of the final endarea file will have the same prefix as the alignment. Though not a strict standard, it is useful to number the chains so that odd stations are on the left and even stations are on the right, ideally in increasing order as you move out from the alignment itself.

Right of Way Geometry Chains

The basic naming convention for proposed right of way geometry chains is to prefix the geometry chain name with "ROWP." An odd number indicates a chain left of the controlling alignment and an even number indicates one to the right. The designer assigns the geometry chain a feature of ROWP. The designer should make full use of the description field if additional information is needed to describe the element beyond what is required by the element-naming convention.

6.2.3.4 Superelevation Lines

The basic superelevation line element-naming convention is to append the alignment name with "E." Superelevation lines will always start at 1.

Example:

LL1E1 through **LL1Exxx** – Supers for LL Line

6.2.3.5 Profiles

Each profile used in the final design will have its own grid settings stored in the project. Grids will be set up near but not overlap the project data and will not overlap one another.

The basic CAiCE **terrain profile** file naming convention is to make the file name the same as the horizontal alignment name with an indication of what DTM was used.

Example:

L1A1EXIST – Terrain profile of LL1 alignment and EXIST DTM

The basic CAiCE **design profile** element-naming convention is to prefix the name with the horizontal alignment name as described earlier in this section and append the prefix with the design profile alternative indicator.

Examples:

LL1A1P1 – First profile for alternate 1 of LL1 alignment

LL1A1P2 – Second profile for alternate 1 of LL1 alignment

6.2.3.6 Temporary Design Elements

The prefixes TEMP and KC will be reserved for temporary or trial elements. Elements that have these prefixes should be renamed before acceptance into the final database.

6.2.3.7 Other Design Database Elements

Outside of the requirements above, there are no set standards for what prefixes to use on design data, provided that the total number of characters used in the database element's name is nine or less.

6.2.3.8 Existing Ground Cross Sections

Scanlines

For final alignments, cross section scanlines are created for all stations required for construction as follows:

- All roadway width change stations
- All superelevation change stations
- All roadway template change stations (surface depths, ditch widths, slopes, etc.)
- Any odd cut and fill zero stations that have been generated and used by the designer in the calculation of final design volumes not entered as exception stations using the Advanced Endarea Volumes command
- All abrupt stations for cutoffs
- All structure stations (bridge abutments, retaining walls, subdrains, guardrail, barrier etc.)
- All high and low point break stations

- All intersection stations (curb returns, abrupt stations for cutoffs, etc.)
- Any other miscellaneous odd stations generated and used by the designer in the calculation of final design volumes

The basic scanline element-naming convention is to append the alignment name with “X.” Scanline will always start at 1.

Example:

LL1X1 through **LL1X1xxx** – Scanlines for LL Line

Odd Station Text File

For each final alignment, the designer creates and maintains an odd station text file that identifies stations that fall outside the even station interval used when generating the cross section scanlines.

The file naming convention for this file is to prefix the file name with the name of the associated horizontal alignment and “PLUS_STATIONS.”

Example:

LLA1_PLUS_STATIONS.LIS – LL1A1 odd station list

Existing Condition Cross Section EAR Files

Existing Condition cross section EAR files contain cross sections at all stations required for construction, as detailed earlier in this section.

The basic naming convention for creating a base cross section EAR File is to prefix the EAR file name with the horizontal alignment name and the DTM name(s) with multiple names separated by dashes.

Examples:

LL1A1_EXIST.EAR – Horiz. Align: LL1A1, Surface used EXIST

LR1_EXIST-SUB1.EAR – Horiz. Align: LR1, Surfaces used EXIST and SUB1

6.2.3.9 Design Cross Sections

EAR Files

Final design cross section EAR files contain cross sections at all stations required for construction as detailed earlier in this section. Standard WSDOT fragments will be used in compiling all finished endarea files.

The basic naming convention for creating a design cross section EAR File is to prefix the EAR File name with the profile name (which also indicates the horizontal alignment) used in the endarea. The name ends with a description if additional information is needed to describe the file’s contents.

Examples:

LL1A1P1_EXIST_STAGE1.EAR – Input file: LL1A1Exist, Horiz Align: LL1A1, Vert. Prof: LL1A1P1, Output Desc: Stage1 cross sections

LR1P2_EXIST-SUB1_FINISH.EAR – Input file: LR1_EXIST-SUB1, Horiz Align: LR1, Vert. Prof: LR1P2, Output Desc: Finished cross sections.

Surface Names

The basic design endarea surface naming conventions are defined by WSDOT’s standard fragment input parameter defaults. Renaming the design cross section surfaces by changing fragment input parameter defaults will only be done if there are legitimate design requirements necessitating deviation from WSDOT standard conventions.

If a designer deviates from the standard defaults, the design cross section surface names will be descriptive, have a maximum of seven characters, and will be added as new line features into the project feature table.

Fragment Hook Chains

WSDOT design fragments provide the capability to define roadway widths and the location of design items such as walls and ditches using longitudinal geometry chains. This functionality will be used to define roadway edges and tapers where there is variation in roadway width.

Fragment hook chains will have the same prefix as the controlling alignment with an odd number indicating a chain to the left and an even number indicating a chain to the right.

Fragment Hook Profiles

WSDOT design fragments provide the capability to define specific elevations in endarea files using a longitudinal profile. Examples of where such profiles may be useful:

- Profile to control the depth of ditches in cut
- Profile to control the elevation of berms in cut and fill

Fragment hook profile names will be prefixed with the controlling horizontal alignment's name, followed by the character "P" and then the profile number.

The designer should make full use of the description field if there is additional information needed to describe the element beyond what is required by the element-naming convention.

Design Template VRD Files

The basic design template VRD file-naming convention is the name of the endarea file for which the template was developed, followed by the beginning station of the station range for which the template is to be applied. The examples below indicate two templates for the LL1AP1_EXIST_STAGE1.EAR file. The first template is for the station range 113+00 to the last station before 115+25 in the original ground EAR file. The second entry indicates a template to be applied at station 115+25 to either the end of the construction or to the station indicated in the next VRD file for that EAR file.

Examples:

LL1A1P1_EXIST_STAGE1_11300.VRD

LL1A1P1_EXIST_STAGE1_11525.VRD

Design VRS Files

The basic design VRS file-naming convention is to give the VRS file the same name as the endarea file with which it is associated. There must be a VRS file to recreate every finished EAR file in the final design.

Design Earthwork Classification Table Files

The basic design earthwork classification table file naming convention is to name the table the same as the endarea file for which is was created followed by a description of the type of table.

Examples:

LL1A1P1_EXIST_STAGE1_EW.TBL – Cut/fill table for LL1A1P1_STAGE1.EAR

LL1A1P1_EXIST_STAGE1_SURF.TBL – Surfacing table for LL1A1P1_STAGE1.EAR

6.2.3.10 DTM Surfaces

Documentation for DTM Surfaces

Documentation for DTM surfaces will be stored in the **Design\DesignDocumentation** folder. The CAiCE Project Documentation spreadsheet (see Section 8.4) contains a tab for documenting the surfaces in the CAiCE project. All the steps necessary to recreate the existing surface from the original data sets will be documented in this file including which datasets to use, any areas that need to be clipped, any transformations necessary, and any edits done in design to the original survey data.

Existing Ground Surface

The DTM surface that best models the existing condition for the project will have the name EXIST and the feature code EXIST. Other existing surface models will start with the characters “EX.”

Finish Surfaces

The DTM surface that best models the finished condition for the project will have the name FIN and the feature code FIN. Other finished surface models will start with the character “F.”

Staged Surfaces

Names of surfaces created for work with staged construction will start with the character “S.”

Pond Surfaces

Names of surfaces created for work with ponds will start with the character “P.”

Volume Computation Surfaces

Delta volume surface name will start with the characters “DV.” The description of the surface will contain information on which surfaces were used in the volume computation.

Clip Boundaries

Clip boundaries for limits of construction that are used in the process of cutting out existing data and replacing it with data from finished EAR files will have the same name as the finished endarea file from which it is derived.

Clip boundaries that define the limits of a supplemental survey will have the same name as the SRV, SDR, or KCM file that contains the original survey data to be clipped in.

Since clip boundaries have no descriptions associated directly with them, designers are encouraged to use descriptive names for then (other than those listed above). All clip boundaries and their uses will be documented in the appropriate DTM History file.

6.2.3.11 Report Files

For each alignment in the final design, there will be a description report and a superelevation report located in the alignment subfolder.

For each profile in the final design, there will be a description report located in the appropriate alignment subfolder.

For each endarea file in the final design used to calculate volumes, there will be an endarea volume report located in the alignment subfolder.

Examples:

LR1.RPT – Description report for alignment

LR1_SUPER.RPT – Superelevation report for alignment

LL1A1P1_EXIST_STAGE1_EW.RPT – Earthwork endarea volume report for LR1P1_STAGE1.EAR

Designers should use descriptive names that relate directly to the design function performed and the data used when creating other design-related report files.

6.2.3.12 CDG Files

Designers will create CDG files of the final design to document the finished product and to make it easier to view. This practice provides the construction staff and other reviewers with an easy method to produce views of all design elements that directly relate to specific final design elements.

- Project CDG Files:
  - Alignment/RW CDG – Displays all project alignments and project R/W limits.

  - Alignment/Hook CDG – Displays all project alignments and their related geometry chains.
  - Existing Condition CDG – Displays the survey data points, survey chains, and surface of the existing condition.
- Design Element-Specific CDG Files:
  - Alignments – For each alignment in the project, there will be a separate CDG of just that alignment and all its related chains.
  - Profiles – For each profile in the project, there will be a CDG file of that profile and its grid.

The basic CAiCE design CDG file-naming convention is to prefix the name with the horizontal alignment profile or surface followed by a description.

6.2.4 Project Closure and Transition

The following requirements will apply after the designer has prepared all the appropriate electronic information for a CAiCE design package as described in Section 6.2.

6.2.4.1 Project Cleanup

The final version of the CAiCE design data should contain design data and all supporting information necessary for the construction office and/or future designers to understand and use the dataset in CAiCE. All data not necessary for construction of the project or of use to future designers should be deleted from the project.

6.2.4.2 Preparation of Archives Subfolder

The following must be provided in the **DESIGN/ARCHIVES** folder:

- Completed CAiCE Designer Checklist (see Section 8.6).
- PostDesign Archive – The PostDesign archive is a zip file created through CAiCE's Project Management System and contains all the CAiCE data and files. It also contains all the resources needed for preparing them including cell files, fragment libraries, feature tables, super and runoff tables and any other files or resources needed to reproduce the design. This is normally achieved by including the project's Design folder in its entirety. Most of these resources are either already in the project folder or can be added easily to the archive by checking the appropriate boxes on the Project Management dialog. The folder containing the fragment library will need to be copied to the project folder by the designer just prior to the Design Archive compilation. The PostDesign Archive's name is prefixed with the project name and appended with "_CAICE_POSTDESIGN."
- ForConstruction Archive – The ForConstruction archive is a zip file created through CAiCE's Project Management System and is a subset of the PostDesign Archive. It contains only the information from the PostDesign Archive that is needed by the construction office. All data relating to non-selected alternates, permit applications, or any other data not needed to construct the project should be removed. The Construction Archive's name is prefixed with the project name and appended with "_CAICE_FORCONSTRUCTION."

6.2.4.3 Delivery of Final Package

General requirements for the transfer, review and acceptance of the data are detailed in Section 2.

Delivery will be accomplished by providing the customer access to the project folder if both the designer and customer share a network resource that allows them both to reference the same folder structure. Access to the entire project folder is necessary when transferring interrelated survey, design and CADD data sets. However, if the InRoads design data is independent of other project data relating to CADD and survey, then access to just the Design subfolder is sufficient.

If a shared network location is not an option, the designer will provide the customer with a copy of the final data. This can be accomplished using any medium that can reliably contain the entire folder structure to be transferred (e.g., an e-mail, an FTP site, a compact disk, or a DVD).

6.2.4.4 Data Archival

On projects where the designer is internal to WSDOT, it is the designer who is responsible for archival of the final electronic design data per the region's policy for archival of electronic project data. When an external supplier is providing data to WSDOT, it is the WSDOT customer who is responsible for archival of the final electronic data per the region's policy.

If no regional archival policy exists, the responsible party needs to ensure the data is appropriately archived for future reference.

7 Plans Preparation

Section 7 defines the file organization structure, data formats, and delivery procedures for the electronic CADD data. These standards are mandatory components of preparing plans for WSDOT. The designer is responsible for resolving all omissions, deficiencies, and errors in a timely manner to prevent any negative impacts on the project schedule.

7.1 PS&E Plan Set

In conjunction with the migration from CAiCE to InRoads as the principle design application, WSDOT is also transitioning from a set of MicroStation standards and resources based on 63 levels to an environment that uses many more levels. These two MicroStation environments are referred to as the "63 level environment" and the "expanded level environment." The 63 level environment is used with CAiCE and the expanded level environment is used with InRoads.

For plan sets prepared in the expanded level environment, the information in the *CADD Standards for MicroStation using Expanded Levels* supersedes the information printed in Sections 3 and 5 of the WSDOT *Plans Preparation Manual*. For expanded level plan sets the *Plans Preparation Manual* and the *CADD Standards for MicroStation using Expanded Levels* contain the standards for the appearance of the final hard copy plan set. **This document (EEDS) contains the requirements and standards relating to the electronic version of expanded level plan sets.**

For plan sets prepared in the 63 level environment, all necessary information for both plan appearance and electronic standards is contained in the printed *WSDOT Plans Preparation Manual.* The *CADD Standards for MicroStation using Expanded Levels* and the EEDS do not apply to 63 level plan sets.

Note: Any further references to the Plans Preparation Manual in this document are referring to both the PPM and the CADD Standards for MicroStation using Expanded Levels. The CADD Standards for MicroStation using Expanded Levels is published only in electronic form and is available on-line from the WSDOT web.

7.1.1 Data Organization

All electronic project files and data will be organized as defined in Sections 3 and 4 of this manual.

7.1.2 General Requirements

7.1.2.1 Project Datum

The datum used in the base plan files shall match the datum and units used throughout the project. Typically this is a project datum in US Survey feet.

7.1.2.2 Sheet Sizes

The finished product sheet size for PS&E plan sheets is 11" x 17." Final plots will be produced at this size. Note: For clarity, the *Plans Preparation Manual* shows WSDOT symbols and text at the size they would appear on a 22" x 34" plan sheet. Symbols and text on the final printed 11" x 17" plans will be one-half the size shown in the *Plans Preparation Manual.*

7.1.2.3 Project-Level Resources

Potential project-level resources include a line style resource file, cell library and/or dgnlib. All project resources must be documented in the PS&E Plan Set Project Documentation spreadsheet. (See Section 8.9). Project-level resources by definition are nonstandard which presents problems with exporting this data to other applications (such as InRoads) and their use should be minimized as much as possible.

7.1.2.4 Referencing 63 Level Data

If older MicroStation design files adhering to WSDOT's previous 63 level standards are to be used in conjunction with files in the current expanded level environment, the following guidelines should be observed:

- If the 63 level data is to be modified, it should be converted to the newer expanded level standards.
- If the 63 level data is to be referenced read-only, it may be left in the 63 level configuration. At the time of attachment, a 63 level design file referenced to an expanded level file must have reference settings of Coincident World, True Scale off and attachment scale of 2:2 *not* 1:1. (These unusual settings are due to the fact that most 63 level files are labeled as International feet, but are actually set to US Survey feet.)

7.1.2.5 ByLevel Symbology

In the WSDOT environment only one feature is drawn on any given level so ByLevel is the standard for color, weight and linestyle for all standard WSDOT features. ByLevel is activated automatically by the WSDOT menu for all standard levels, but is not activated for levels designated as user levels.

7.1.2.6 User Levels

The WSDOT work environment contains many levels designated as user levels that have no standard feature assigned to them. Since users aren't allowed to create new levels, these user levels have been provided for project-specific requirements that necessitate the drawing of elements of non-standard, project specific features. Because any items drawn on user levels is by definition non-standard, they will not translate and export to other WSDOT applications (such as InRoads) as easily as information drawn to WSDOT standards. For this reason, the use of nonstandard information on user levels should be kept to a minimum.

7.1.2.7 Project Filters

Users may create their own filters in specific design files or in the project-level dgnlib. It is recommended that a filter be created at the project level that matches the level configuration for each type of plan in the plan set. For example, there should be project-level filters whose levels correspond to the base plan levels referenced in the drainage plans, channelization plans and so on.

7.1.3 WSDOT Resources and Related Conventions

CAD Drafters will use the most current set of WSDOT resources for MicroStation Expanded Levels including seed files, cell libraries, linestyle resource files, plot configuration files and pen tables.

The WSDOT environment provides files and electronic resources organized under a master resource folder called CAE_RSC (Computer Aided Engineering Resources). Under this master resource folder is a subfolder named MS_ExpandedLevels that contains all the electronic resources necessary for WSDOT PS&E plan set development. (See Figure 7-1

The current set of WSDOT resources are automatically downloaded to all WSDOT computers connected to the WSDOT wide area network and are updated automatically as needed.

WSDOT provides consultants with a complete set of WSDOT standard resource files in the form of cell libraries, dgn libraries, color and pen tables, macros, plot files and config files. The WSDOT resource files are available for download from WSDOT's CAE Consultant Resources web site at:

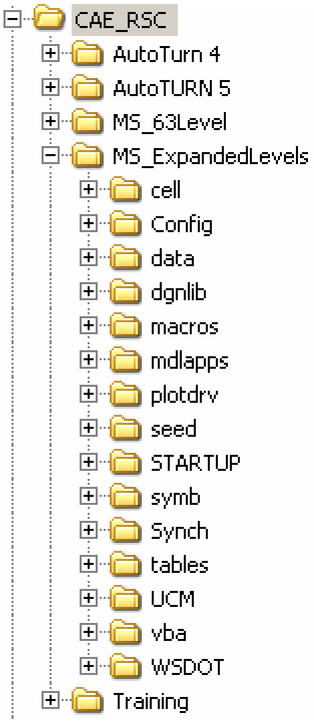
> http://www.wsdot.wa.gov/eesc/CAE/resources

7.1.3.1 Design File Libraries (DGNLib) Files

The WSDOT environment uses two dgn libraries: WSDOT.dgnlib and *projname*.dgnlib. WSDOT.dgnlib contains all the standard levels for WSDOT PS&E plan set development.

CAE_RSC\DGNLIB\WSDOT.DNGLIB contains all the standard levels for the WSDOT environment.

The project level dgnlib is stored in the project directory structure in the **CADD\dgnlib** subfolder. The project level dgnlib contains the user levels and



WSDOT Resource Folders
Figure 7-1

any user-defined filters for the project. NOTE: In order for this file to be available in MicroStation, the **CADD\dgnlib** folder must be added to the MicroStation environment variable MS_DGNLIST. MS-DGNLIST is modified automatically when the WSDOT Create Project macro is used and the MicroStation project is selected through the MicroStation Manager dialog box.

7.1.3.2 Seed Files

WSDOT seed files shall be used when creating files for PS&E plan sets.

The file CAE_RSC\SEED\PSE_BASE.DGN is the seed file to be used when creating PS&E base plan design files.

The file CAE_RSC\SEED\PSE_SHEET.DGN is the file to be used when creating PS&E Sheet design files.

Details on the WSDOT seed files are as follows:

- Base seeds:
  - Master Units: US Survey Feet – FT
  - Sub Units Custom – th (1000 th per FT)
  - Resolution: 1,000,000,000 per US Survey Foot
- Sheet seeds:
  - Master Units: Inches – in
  - Sub Units Custom – th (1000 th per in)
  - Resolution: 1,000,000,000 per Inch

7.1.3.3 Text

All standard WSDOT fonts are in the file CAE_RSC\RSC\FONT.RSC in the WSDOT resources. In most cases font 165 (Arial Italic) shall be used in conjunction with existing features and font 214 (Arial Bold) shall be used in conjunction with new features. Exceptions to this rule are when the *Plans Preparation Manual* specifies the use of the block outline font 42.

Minimum text size for existing text is 0.05” and 0.06” for new text on the final 11” x 17” printed sheets. Text at minimum sizes shall be all upper case. Text at larger sizes may be in upper and lower case.

The correct font and text size for each data item is specified in the *Plans Preparation Manual.* The text size provided in the *Plans Preparation Manual* is the size of the text as it appears on the 11” x 17” printed sheet.

When working in a base plan, the relationship between printed text size in the *Plans Preparation Manual* and the text size setting in MicroStation is

MicroStation setting = final print size x plotting scale.

To place text that is to be .06 inches on the final 50’ per inch plot, multiply .06 inches times 50 feet per inch to get 3 feet. Similarly, the text size setting in MicroStation to produce text at .075 inches on a 1”=100’ scale drawing is .075 inches times 100 feet per inch or 7.5 feet.

When working in a sheet file, the text size should always be set to the true size desired on the final drawing which is the size that is specified in the *Plans Preparation Manual.*

Text size is calculated automatically when using the WSDOT menu based on the scale selected and the type of design file you are working in (sheet or base plan).

7.1.3.4 Cells

CAE_RSC\CELL\WAEDETAILS.CEL is a supplemental cell library containing template cells for details which can be used as starting point for roadway sections and other details.

CAE_RSC\CELL\WAESTATE.CEL contains all the cells and symbols need to produce WSDOT PS&E plan sets. WAESTATE.CEL contains cells that will be placed in base plans and cells that will be placed in sheet files.

Cells designed for placement in the sheet file are named with the **SH** parent code and have master units in inches. These cells are placed directly on the sheet at a scale of 1:1.

Cells that are to be placed in the base plan have master units of feet and are placed according to their type. Cells used in the base plan come in two types: **symbol cells** and **true-size cells**.

- **Symbol cells** are cells that appear on plan sheets that are always the same size regardless of the plan sheet scale. On the printed plan, symbol cells do not reflect the actual size of the object they represent, just the locations. Examples of symbol cells are catch basin and utility pole symbols. WSDOT symbol cells are stored in the cell library at the size they should appear on the printed sheet. When placing these cells in the base plan, they must be scaled up by the same scale factor as the sheet. Thus when placing cells for a base plan that will be plotted at 1"=100', the cell should be placed at an active scale of 100. This scale is set automatically when the WSDOT menu and scale tools are used.
- **True-size cells** are cells that are always the actual ground size of the objects they represent. Examples of non-scaling cell are many of the painted pavement markings such as the HOV symbol and RR crossing symbol. True-size cells are sized in the library so that they should always be placed at an active scale of 100 in the base plan to reflect the true ground size regardless of plotting scale. True-size cells are flagged as such in the *Plans Preparation Manual* and on the WSDOT menu.

Sheet cells can be placed in the base plan by selecting the desired plotting scale and making sure that the True Scale option is turned off. Base plan cells can be placed in a sheet file by selecting a scale of 1 and making sure that the True Scale option is turned off.

The correct cell size is calculated automatically when using the WSDOT menu based on the scale selected, the type of design file you are working in (sheet or base plan) and the type of cell being placed.

7.1.3.5 Linestyles

All custom linestyles needed to produce WSDOT PS&E plan sets are in CAE_RSC\SYMB\ELSTYLE.RSC. WSDOT custom linestyles are stored in the linestyle resource file at the true size they will appear on the printed sheet. When placing custom linestyles in the base plan, they must be scaled up by the same scale factor as the sheet. Thus when placing a linestyle that will be plotted out at 1"=100', the linestyle should be placed at an active linestyle scale of 100.

If a custom linestyle needs to be placed in the sheet file (e.g., in a legend), it should be placed at an active linestyle scale of 1.

Custom linestyle scales are calculated automatically when using the WSDOT menu based on the scale selected and the type of design file you are working in (sheet or base plan).

7.1.3.6 Color Table

In general the color table C:\CAE_RSC\SYMB\COLOR.TBL should be attached to WSDOT design files. COLOR.TBL is set up to color all elements per their parent codes so that each parent code has its own color.

Optionally COLOR2.TBL may be useful when working on a specific major category of features as it breaks up the set of elements having the same parent code into subgroups that show up with different colors.

For example with COLOR.TBL attached all proposed utilities display in the same color. With COLOR2.TBL attached, proposed utilities display with the different utility types (water, gas, telephone, etc.) in different colors.

7.1.3.7 Plot Configuration Files

When plotting WSDOT PS&E plan sets, the plot configuration files under CAE_RSC\PLOTDRV must be used to ensure the linestyles and weights plot out properly. The major plot configuration files and their uses are shown in Figure 7-2 below.

EngBWFull.plt	Black and white, 34 x 22 plots
EngBWHalf.plt	Black and white, 11 x 17 plots
EngCFull.plt	Color, 34 x 22 plots
EngCHalf.plt	Color, 11 x 17 plots
PDF_EngBWFull.plt	PDF format, black and white, 34 x 22 plots
PDF_EngBWHalf.plt	PDF format, black and white, 11 x 17 plots
PDF_EngCFull.plt	PDF format, color, 34 x 22 plots
PDF_EngCHalf.plt	PDF format, color, 11 x 17 plots

Plot Configuration Files
Figure 7-2

7.1.3.8 Pen Table

When plotting WSDOT PS&E plan sets, the pen table CAE_RSC\PLOTDRV\WSDOT.TBL must be used. WSDOT.TBL enables the plotting fields on WSDOT sheet borders and ensures that filled elements are plotted first.

7.1.4 File Types and Requirements

Data for a MicroStation PS&E electronic plan set is stored in either a base plan file or a sheet file. This section will define these two file types and their requirements.

7.1.4.1 Base plans

Base plans contain all coordinate based information for the plan set. This includes all survey data, photogrammetry data, locations for all new data and all text related to those elements and features.

Depending on the size and other factors of any specific project, there may be one or more base plans. For small projects where there is one primary designer it may make the most sense to keep all coordinate based data in one base plan. With more complicated projects it will probably be more efficient to split the coordinate based information into multiple base plans. Typically these multiple base plans would contain data for different areas of the design (e.g., drainage, channelization, and site preparation). A multiple base plan organization allows more than one designer to access and work on base plan data simultaneously. Either configuration is acceptable.

File Naming for Basemaps

Base plans will all have a file type code of BP. (See Section 4.3 of this document for complete details).

Examples:

P1234_BP_EXIST.DGN	Base plan containing all existing data for project P1234
P1234_BP_DR.DGN	plan containing all new drainage data for project P1234
P1234_BP_ALRW.DGN	plan containing all new alignment and r/w data for project P1234

Saved Views and Project Filters in Base Plan Files

WSDOT base plans must contain saved views (or saved views in combination with filters) that display the area and levels in the basemap that correspond to any particular sheet to which the base plan is referenced.

This allows users to see the correct area and levels in the base plan as it will be displayed on the final plotted sheets. When a user recalls a saved view in the basemap, the user should see the same “picture” that is plotted on the sheet in terns of both the levels and area displayed. The levels displayed by the saved view (and/or filter) used in the base plan and the levels displayed by the reference attachments derived from that saved view in the project’s sheet files must be kept the same.

It is recommended that project filters be set up to store the various level schemes for each type of plan sheet. These filters can then be used to adjust levels in the sheet files and in the base plans.

If such project filters are used, base plans must also have saved views to recall the location for the area of the base plan used in each sheet. These generic saved views would not save level configurations and would have generic names such as Sheet1, Sheet2, Sheet3, etc. Such saved views allow users to recall any particular sheet’s location and then use the project filters to adjust the level display to match the desired sheet.

If project filters are not used, base plans must have saved views that will recall both the location and the levels used for each plan sheet. These sheet specific saved views will have names that correspond the to sheet reference number found in the lower right corner of the plan sheet above the sheet number—DR1, DR2, CH1, CH2, and so on.

All saved views in the base plan must be rotated so that the controlling alignment is horizontal across the saved view. This rotation of the saved view is what controls the orientation of the reference file in the attachment to the sheet file.

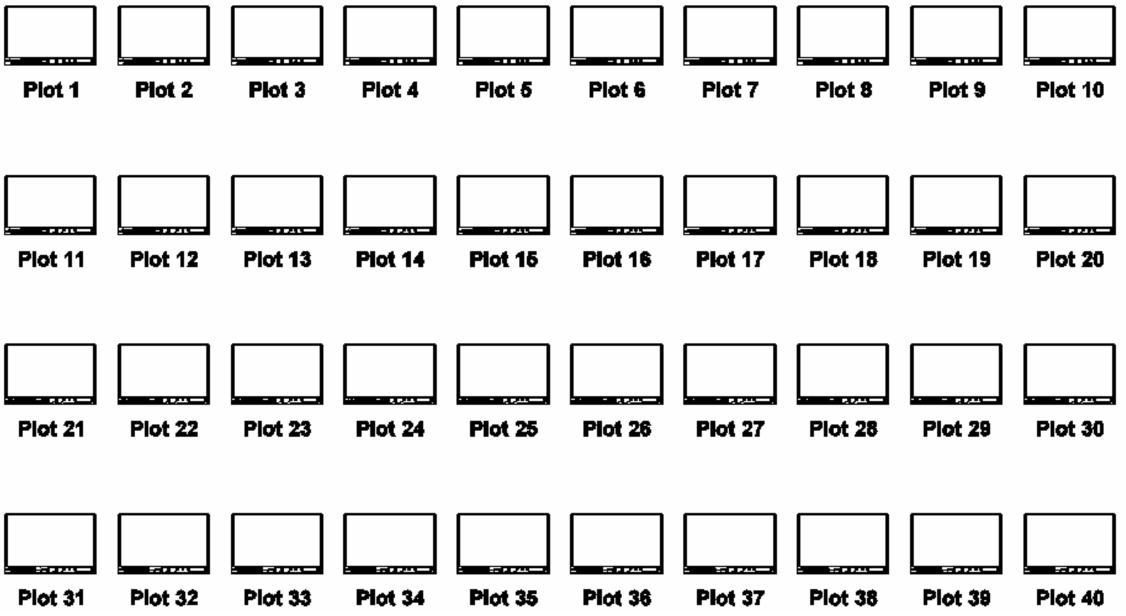
7.1.4.2 Sheet Files

Sheet files contain all the sheet borders with associated title bar information and all elements that are placed in relation to the sheet border such as legends, scale bars, match lines and north arrows.

Sheet files are created from WSDOT seed files to ensure that their master units are inches.

Placing Sheet borders

Sheet borders are placed in the sheet file at an active scale of 1 in a matrix shown in Figure 7-3 below: Each border measures 11” x 17”.



WSDOT Sheet Matrix
Figure 7-3

The origin of the matrix is the lower left corner of Plot 1 and is at coordinates of 100000, 100000. The rows are 20 inches apart and the columns are 30 inches apart. The matrix can contain up to 40 sheets, but borders should only be placed as needed. Final sheet files should not contain any empty borders.

Use of the WSDOT Place Sheet macro assures compliance in regard to sheet sizes and locations

Saved Views in Sheet Files

A saved view should be created for each sheet location. The saved view name will be PLOT 1, PLOT 2, and so on. When the saved view is recalled, the entire sheet border should be displayed. The levels displayed by the saved view must match the levels that are to be plotted.

The WSDOT Place Sheet macro automatically creates the correct saved views when the sheet borders are placed.

Reference Attachments to Sheets

The WSDOT resources have been set up so that when the base plan is referenced to a sheet border, it is referenced at the same scale as the desired final plot. Thus for a 50' to 1" plot the reference attachment scale is 50:1. Likewise for a 10' to 1" plot, the reference attachment scale is 10:1.

The levels displayed by the reference attachment and the levels stored in the base plan's saved view (and/or filter) used in the creation of that attachment must be kept in synch with one another.

7.1.5 PS&E Plan Set Documentation

7.1.5.1 PS&E Plan Set Documentation Sheet

(For form template and sample see 8.9)

The following items should be documented for each plan set:

- State Route(s) and mileposts
- File Units
- Scale used

7.1.5.2 PS&E Base Plan Documentation Sheet

(For form template and sample see 8.10)

The following items should be documented for each base plan file:

- Other DGN files referenced
- Occupied user levels and design elements drawn on them
- Filters/saved views to be used to call up sheet views
- Raster images attached

7.1.5.3 PS&E Sheet File Documentation Sheet

(For form template and sample see 8.11)

The following items should be documented for each sheet contained in a sheet file:

- Plot location
- Sheet ID
- Files and/or raster images referenced
- List of levels or filter to display sheet's reference files properly
- Scale and rotation angle of reference files

7.1.6 Project Closure and Transition

After the supplier has prepared a complete MicroStation PS&E design package as described in Section 7.1 by preparing all the appropriate electronic information the following requirements will apply.

7.1.6.1 Project Cleanup

The final version of the PS&E plan set should contain the base plans (folder CADD\Baseplans), sheet files (folder CADD\PS&ESheets), backups of resources used (folder CADD\PS&ESheets\ResourceBackups) and any other supporting information necessary for the customer and/or future designers to understand and use the plan set in MicroStation. All data not necessary for production of the final plan set or of use to future designers or drafters should be deleted from the project.

7.1.6.2 Preparation of PS&E Data Within CADD-Folder

The following must be provided in the **CADD\PS&ESheets** folder:

- Completed PS&E Plan set Checklist
- **ResourceBackup** subfolder– This subfolder is to be created at project finalization. The resource files needed to recreate the PS&E plan set must be copied to this location. Resource files that should be copied are all cell libraries, linestyle resource files, dgn libraries (both WSDOT standard and project specific, font resource files and color tables.

The following must be provided in the **CADD\Basemaps** folder:

- All basemaps used in PS&E plan set

The following must be provided in the **CADD\CADDDocumentation** folder:

- Documentation as described in previous section

7.1.6.3 Delivery of Final Package

General requirements for the transfer, review and acceptance of the data are detailed in Section 2.

A complete PS&E plan set package will be prepared as described in Section 7 by compiling all the appropriate electronic information and notifying the customer that the project has been finalized.

Delivery will be accomplished by providing the customer access to the project folder if both the designer and customer share a network resource that allows them both to reference the same folder structure. Access to the entire project folder is necessary when transferring interrelated survey, design and CADD data sets. However, if the InRoads design data is independent of other project data relating to CADD and survey, then access to just the Design subfolder is sufficient.

If a shared network location is not an option, the designer will provide the customer with a copy of the final data. This can be accomplished using any medium that can reliably contain the entire folder structure to be transferred (e.g., an e-mail, an FTP site, a compact disk, or a DVD).

7.1.6.4 Data Archival

On projects where the supplier is internal to WSDOT, it is the supplier who is responsible for archival of the final electronic design data per the region’s policy for archival of electronic project data. When an external supplier is providing data to WSDOT, it is the WSDOT customer who is responsible for archival of the final electronic data per the region’s policy.

If no regional archival policy exists, the responsible party needs to ensure the data is appropriately archived for future reference.

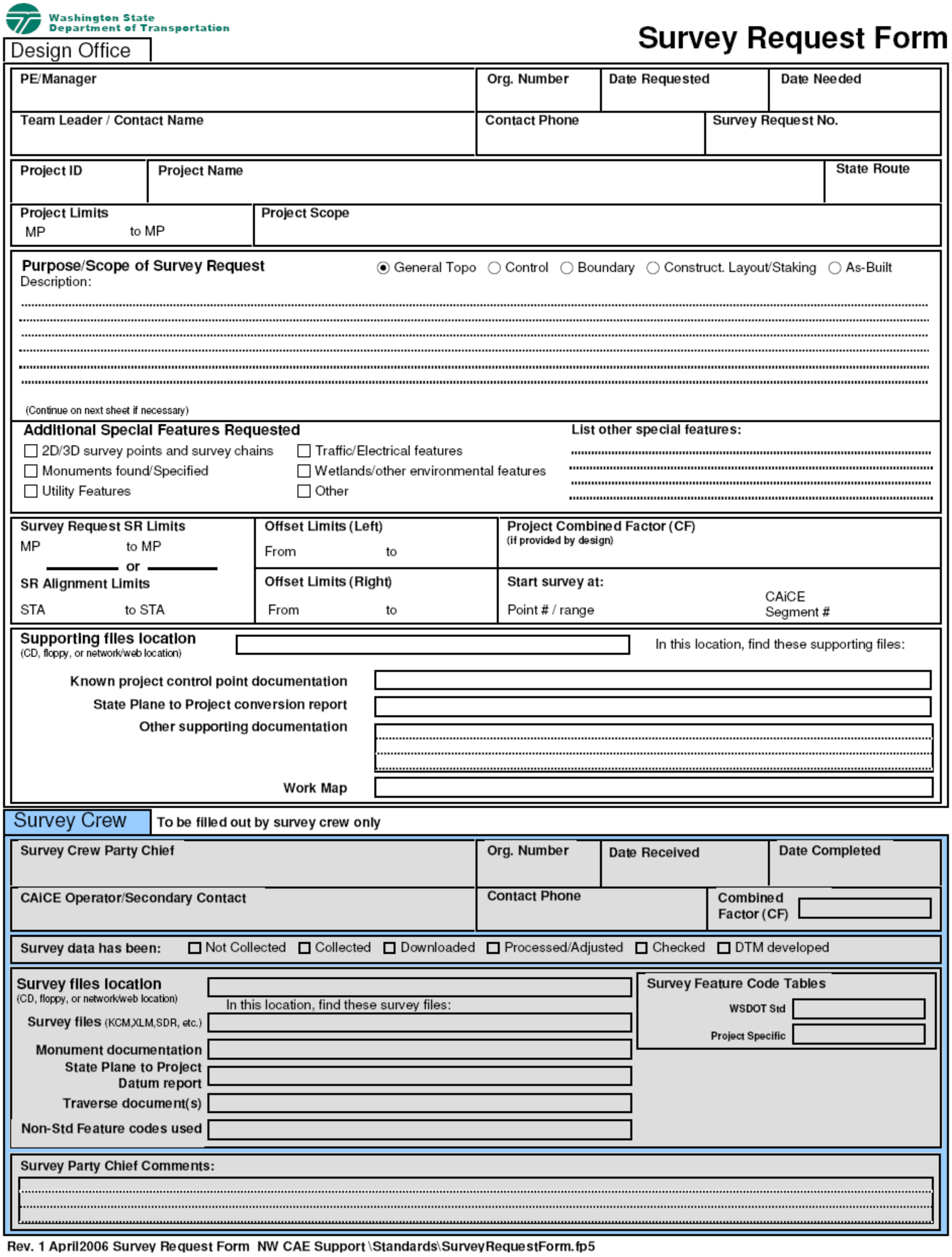
8 Forms

This section contains images of the forms referenced in this manual. These images have been resized to fit in this manual. The actual electronic (original editable version and printable pdf version) are available at

http://www.wsdot.wa.gov/eesc/cae/eeds_forms.htm

The electronic forms, not the samples in this manual, should be used for WSDOT work.

8.1 Survey Request Form



Washington State Department of Transportation

Design Office

Survey Request Form

PE/Manager	**Org. Number**	**Date Requested**	**Date Needed**
Team Leader / Contact Name	**Contact Phone**	**Survey Request No.**	

Project ID	**Project Name**	**State Route**
Project Limits MP to MP	**Project Scope**	

Purpose/Scope of Survey Request ● General Topo ○ Control ○ Boundary ○ Construct. Layout/Staking ○ As-Built

Description:

……

(Continue on next sheet if necessary)

Additional Special Features Requested

☐ 2D/3D survey points and survey chains

☐ Monuments found/Specified

☐ Utility Features

☐ Traffic/Electrical features

☐ Wetlands/other environmental features

☐ Other

List other special features:

Survey Request SR Limits MP to MP	**Offset Limits (Left)** From to	**Project Combined Factor (CF)** (if provided by design)
or **SR Alignment Limits** STA to STA	**Offset Limits (Right)** From to	**Start survey at:** Point # / range CAiCE Segment #

Supporting files location
(CD, floppy, or network/web location)

In this location, find these supporting files:

Known project control point documentation

State Plane to Project conversion report

Other supporting documentation

Work Map

Survey Crew — **To be filled out by survey crew only**

Survey Crew Party Chief	**Org. Number**	**Date Received**	**Date Completed**
CAICE Operator/Secondary Contact	**Contact Phone**	**Combined Factor (CF)**	

Survey data has been: ☐ Not Collected ☐ Collected ☐ Downloaded ☐ Processed/Adjusted ☐ Checked ☐ DTM developed

Survey files location
(CD, floppy, or network/web location)

In this location, find these survey files:

Survey files (KCM,XLM,SDR, etc.)

Monument documentation

State Plane to Project Datum report

Traverse document(s)

Non-Std Feature codes used

Survey Feature Code Tables

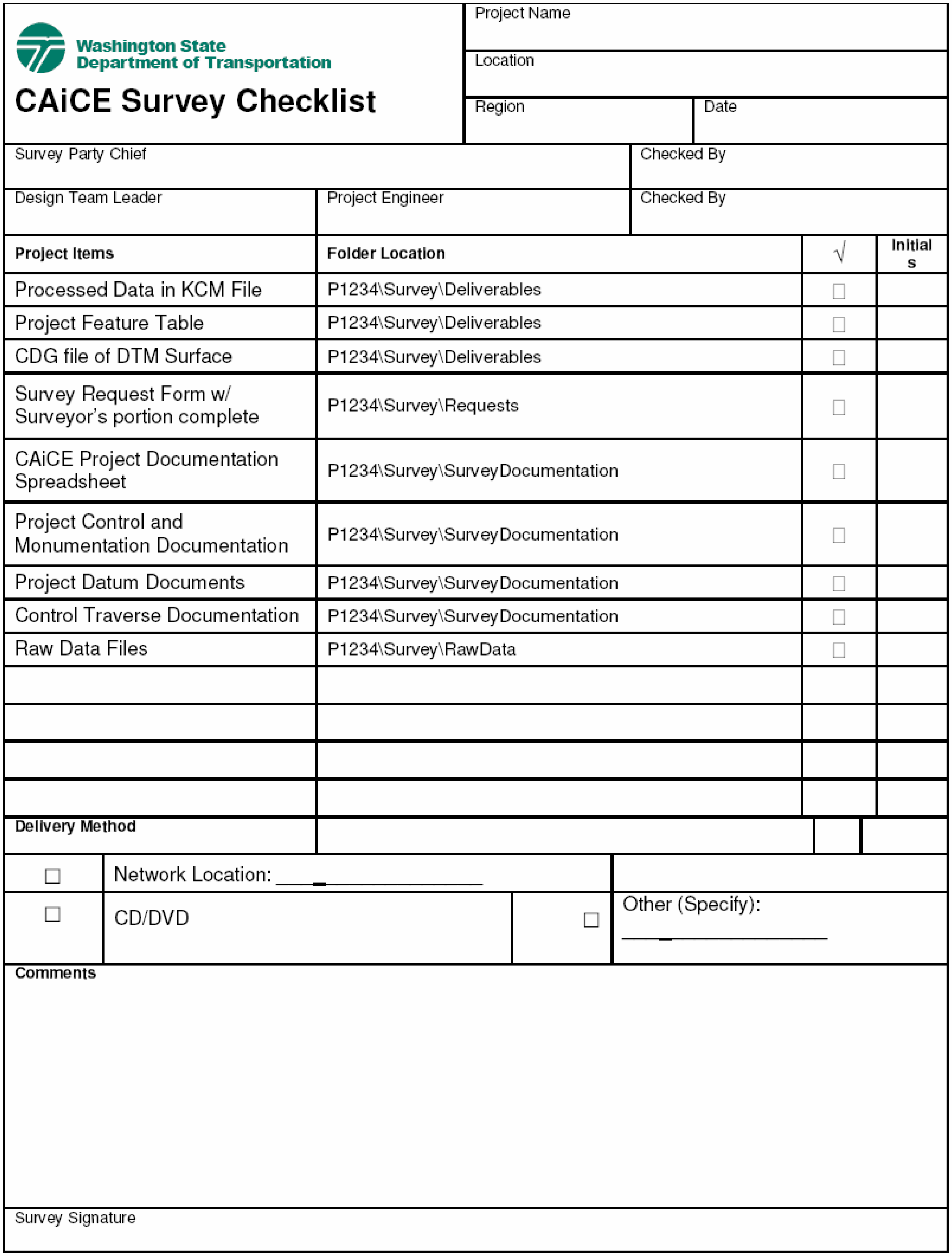
WSDOT Std

Project Specific

Survey Party Chief Comments:

Rev. 1 April2006 Survey Request Form NW CAE Support \Standards\SurveyRequestForm.fp5

8.2 CAiCE Location Survey Checklist



Washington State
Department of Transportation

CAiCE Survey Checklist

Project Name

Location

Region

Date

Survey Party Chief

Checked By

Design Team Leader

Project Engineer

Checked By

Project Items	**Folder Location**	√	**Initials**
Processed Data in KCM File	P1234\Survey\Deliverables	☐	
Project Feature Table	P1234\Survey\Deliverables	☐	
CDG file of DTM Surface	P1234\Survey\Deliverables	☐	
Survey Request Form w/ Surveyor's portion complete	P1234\Survey\Requests	☐	
CAiCE Project Documentation Spreadsheet	P1234\Survey\SurveyDocumentation	☐	
Project Control and Monumentation Documentation	P1234\Survey\SurveyDocumentation	☐	
Project Datum Documents	P1234\Survey\SurveyDocumentation	☐	
Control Traverse Documentation	P1234\Survey\SurveyDocumentation	☐	
Raw Data Files	P1234\Survey\RawData	☐	

Delivery Method

☐ Network Location: ____________________

☐ CD/DVD

☐ Other (Specify): ____________________

Comments

Survey Signature

8.3 InRoads Location Survey Checklist

Washington State Department of Transportation

InRoads Survey Checklist

Project Name		
Location		
Region	Date	
Survey Party Chief		Checked By
Design Team Leader	Project Engineer	Checked By

Project Items	**Folder Location**	√	**Initials**
Processed Data in Fieldbooks (*.fwd)	P1234\Survey\Deliverables	☐	
MicroStation Graphics File	P1234\Survey\Deliverables	☐	
Surface File	P1234\Survey\Deliverables	☐	
Geometry Project	P1234\Survey\Deliverables		
Survey Request Form w/ Surveyor's portion complete	P1234\Survey\Requests	☐	
InRoads Project Spreadsheet	P1234\Survey\SurveyDocumentation	☐	
Project Control and Monumentation Documentation	P1234\Survey\SurveyDocumentation	☐	
Project Datum Documents	P1234\Survey\SurveyDocumentation	☐	
Control Traverse Documentation	P1234\Survey\SurveyDocumentation	☐	
Raw Data Files	P1234\Survey\RawData	☐	

Delivery Method

☐ Network Location: ____________________

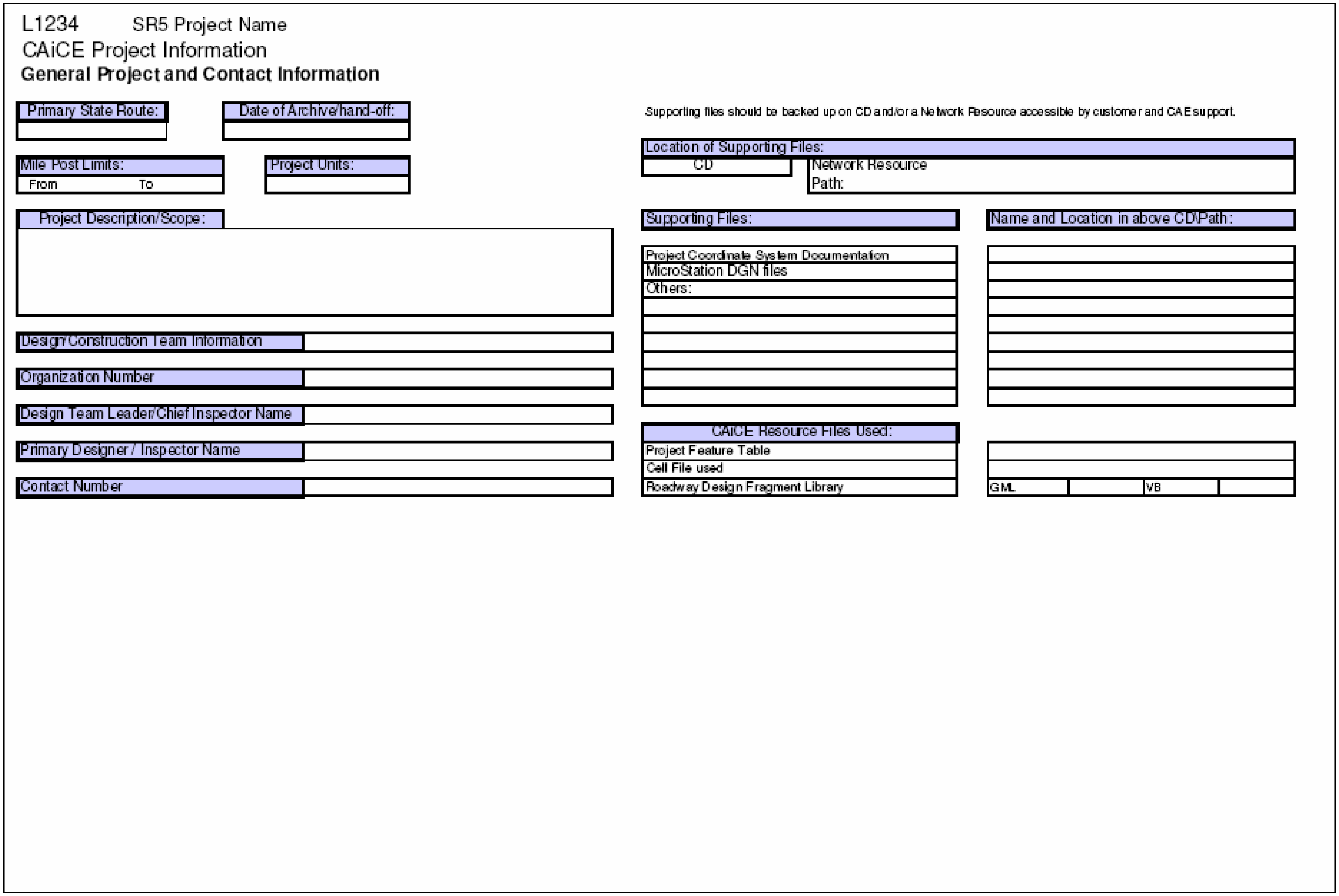
☐ CD/DVD

☐ Other (Specify): ________________

Comments

Survey Signature

8.4 CAiCE Project Spreadsheet



L1234 SR5 Project Name
CAiCE Project Information
General Project and Contact Information

Primary State Route:

Date of Archive/hand-off:

Mile Post Limits:
From To

Project Units:

Project Description/Scope:

Design/Construction Team Information

Organization Number

Design Team Leader/Chief Inspector Name

Primary Designer / Inspector Name

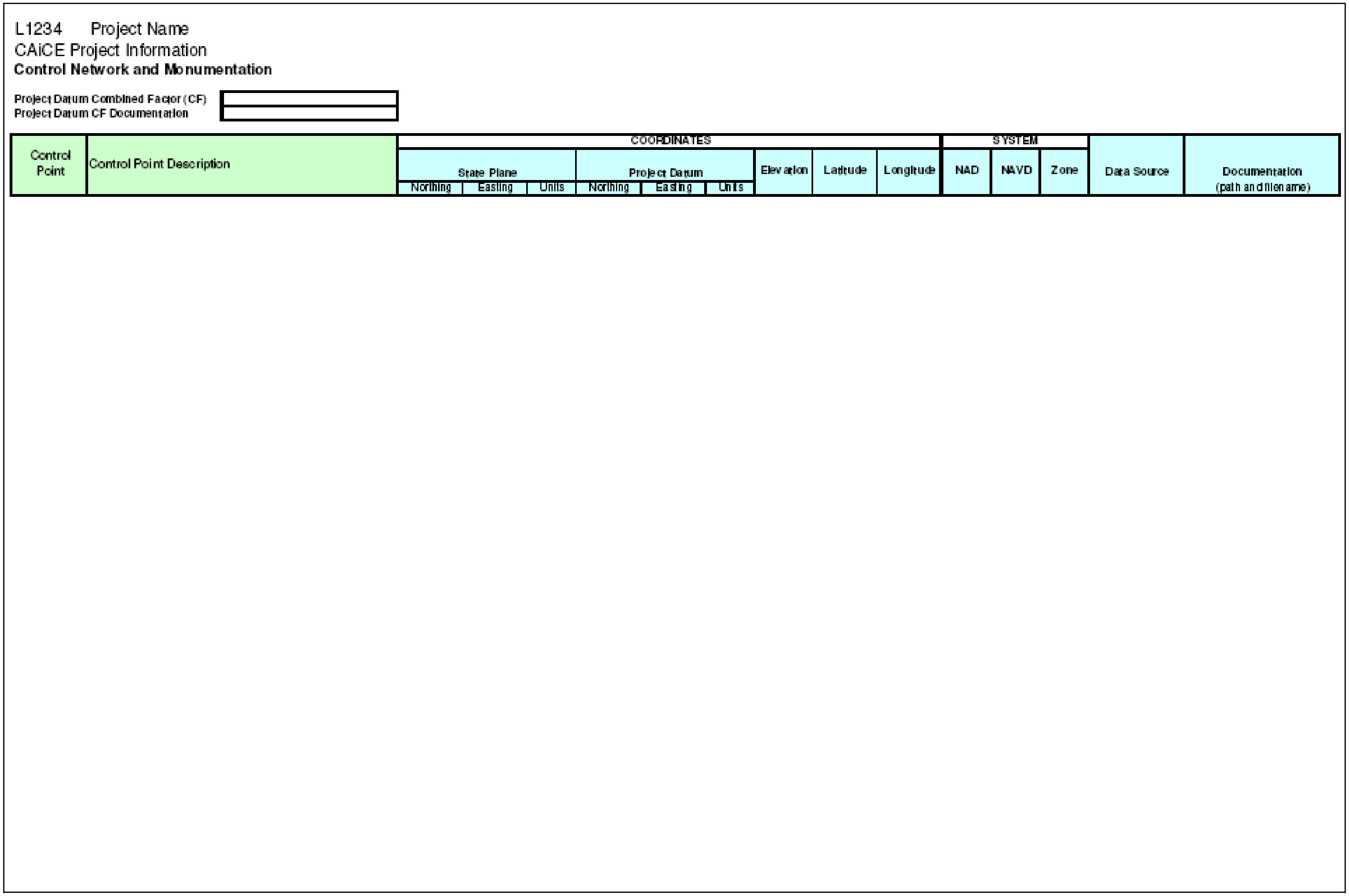
Contact Number

Supporting files should be backed up on CD and/or a Network Resource accessible by customer and CAE support.

Location of Supporting Files:
CD
Network Resource
Path:

Supporting Files:	Name and Location in above CD\Path:
Project Coordinate System Documentation	
MicroStation DGN files	
Others:	

CAiCE Resource Files Used:				
Project Feature Table				
Cell File used				
Roadway Design Fragment Library	GML		VB	



L1234 Project Name
CAiCE Project Information
Control Network and Monumentation

Project Datum Combined Factor (CF)
Project Datum CF Documentation

Control Point	Control Point Description	COORDINATES									SYSTEM			Data Source	Documentation (path and filename)
		State Plane			Project Datum			Elevation	Latitude	Longitude	NAD	NAVD	Zone		
		Northing	Easting	Units	Northing	Easting	Units								

L1234 Project Name
CAiCE Project Information
Alignments (Mainline, Minor Rdw'y, Road Approaches)

Geometry Chain	Chain Description	CORRESPONDING										
		Existing Profile (*.PF$)	Design Profile	Existing Endarea File (*.EAR)	Finished Endarea File (*.EAR)	DTM Clip File (*.CLP)	DTM SRV File (*.SRV)	Design File (*.VRS)	Earthwork Class Table- EW (*.TBL)	Endarea Qtys Report- EW (*.ERP)	Earthwork Class Table - Wall (*.TBL)	Endarea Qtys Report Wall (*.ERP)

L1234 Project Name
CAiCE Project Information
Survey Segments

					CORRESPONDING			
Segment Name	Segment Description	Surveyed By			Traverse Notes	Data Backup Location		Segment Datum
		Name	Contact Number	Agency		Raw Data	RCM File	

L1234 Project Name
CAiCE Project Information
Drainage Structures and Controlling Drainage Geometry

Geometry Chain	Chain Description	CORRESPONDING										
		Existing Profile (*.PF$)	Design Profile	Existing Endarea File (*.EAR)	Finished Endarea File (*.EAR)	DTM Clip File (*.CLP)	DTM SRV File (*.SRV)	Design File (*.VRS)	Earthwork Class Table - EW (*.TBL)	Endarea Qtys Report EW (*.ERP)	Earthwork Class Table - Wall (*.TBL)	Endarea Qtys Report Wall (*.ERP)

L1234 Project Name

CAiCE Project Information

Retaining Walls, Noise Walls, and other Structures

Geometry Chain	Chain Description	CORRESPONDING										
		Existing Profile (*.pls)	Footing Profile	Top of Wall Profile	Finished Endarea file (*.EAR)	DTM Clip File (*.CLP)	DTM SRV File (*.SRV)	Design File (*.VRS)	Earthwork Class Table - EW (*.TBL)	Endarea Qtys Report EW (*.ERP)	Earthwork Class Table - Wall (*.TBL)	Endarea Qtys Report Wall (*.ERP)

L1234 Project Name
CAiCE Project Information
Digital Terrain Models (DTMs)

DTM Surface Name	Surface Description	DEVELOPED BY								
		Survey Points and Chains - List Segments		Another DTM		SRV File(s)			Delta Surfaces	
		Segments	Sequence #	Surface name	Sequence #	File Name(s)	Clipped?	Sequence #	Original	Proposed

8.5 Project Journal Template

[ProjectID] [Project SR #, MP ## to ##]

Project Journal

[Project Name]

[Designer Name, Contact #]

Date	Journal Entry	Reference Files

Project Journal Template.xls

1 of 1

8.6 CAiCE Designer Checklist

WSDOT Department of Transportation **CAiCE Design Checklist**	Project Name	
	Location	
	Region	Date

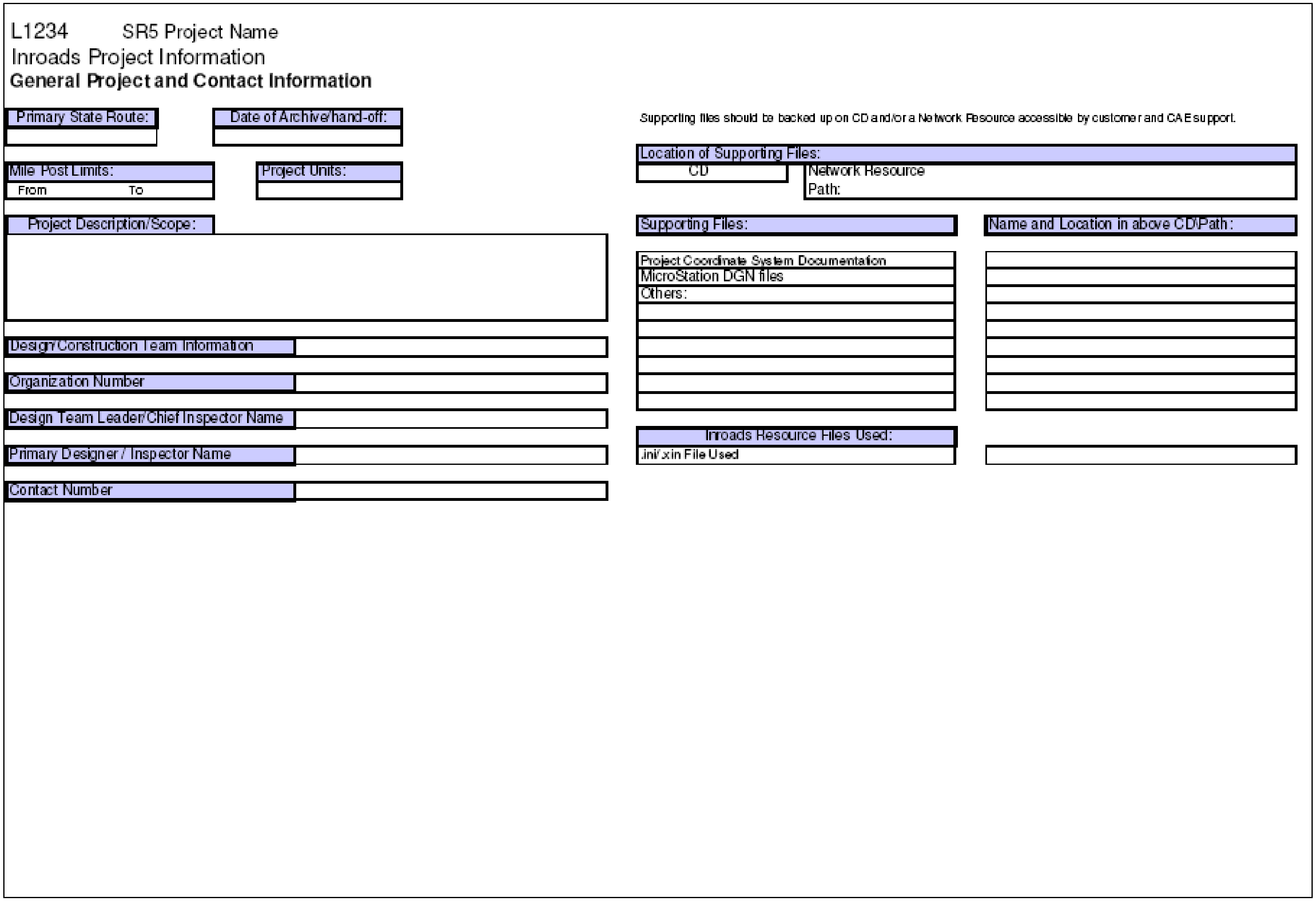
Design Team Leader	Project Engineer	Checked By

Project Items	**Folder Location**	√	**Initials**
CAiCE Project Spreadsheet	P1234\Design\DesignDocumentation		
Datum		☐	_____
Monumentation		☐	_____
Alignment/Endarea		☐	_____
Segments		☐	_____
Drainage		☐	_____
Structures		☐	_____
DTMs		☐	_____
Journal	Design\DesignDocumentation	☐	______
Project-specific FTB	P1234\Design\P1234	☐	______
Odd Station Lists	C:\AAWork\Projects\P1234\Align_name	☐	______
Project CDG	C:\AAWork\Projects\P1234\Design\Surfaces	☐	______
Alignment CDGs	C:\AAWork\Projects\P1234\Design\Libraries	☐	______
Profile CDGs	C:\AAWork\Projects\P1234\Design\Reports	☐	______
End Area Volumes	C:\AAWork\Projects\P1234\Design\Reports	☐	______

Comments

Signature

8.7 InRoads Project Spreadsheet



L1234 SR5 Project Name

Inroads Project Information

General Project and Contact Information

Primary State Route:

Date of Archive/hand-off:

Mile Post Limits:

From To

Project Units:

Project Description/Scope:

Design/Construction Team Information	
Organization Number	
Design Team Leader/Chief Inspector Name	
Primary Designer / Inspector Name	
Contact Number	

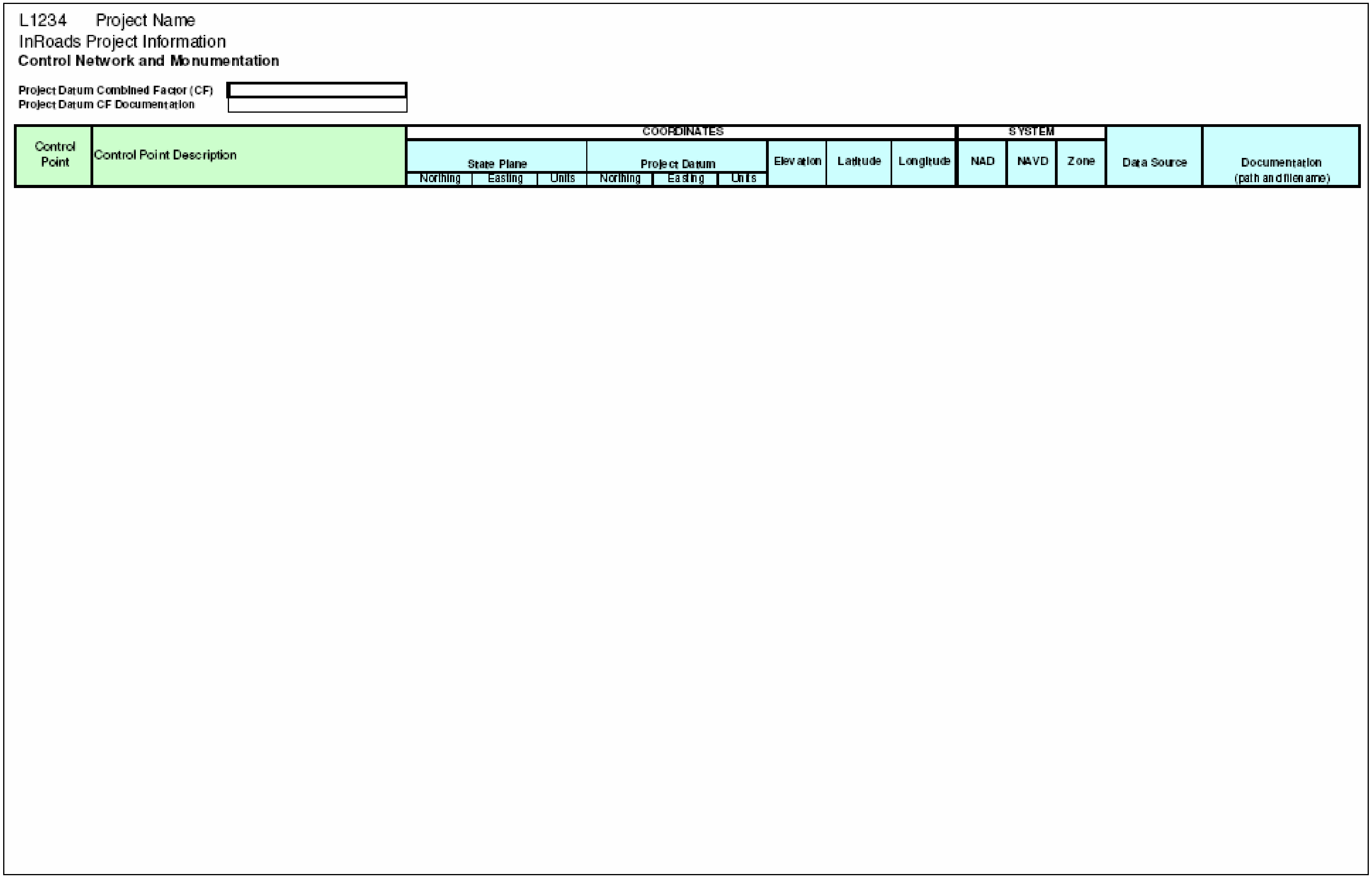
Supporting files should be backed up on CD and/or a Network Resource accessible by customer and CAE support.

Location of Supporting Files:

CD	Network Resource Path:

Supporting Files:	Name and Location in above CD/Path:
Project Coordinate System Documentation	
MicroStation DGN files	
Others:	

Inroads Resource Files Used:	
.ini/.xin File Used	



L1234 Project Name

InRoads Project Information

Control Network and Monumentation

Project Datum Combined Factor (CF)

Project Datum CF Documentation

Control Point	Control Point Description	COORDINATES									SYSTEM			Data Source	Documentation (path and filename)
		State Plane			Project Datum			Elevation	Latitude	Longitude	NAD	NAVD	Zone		
		Northing	Easting	Units	Northing	Easting	Units								

L1234 Project Name
InRoads Project Information
Alignments (Mainline, Minor Rdw'y, Road Approaches)

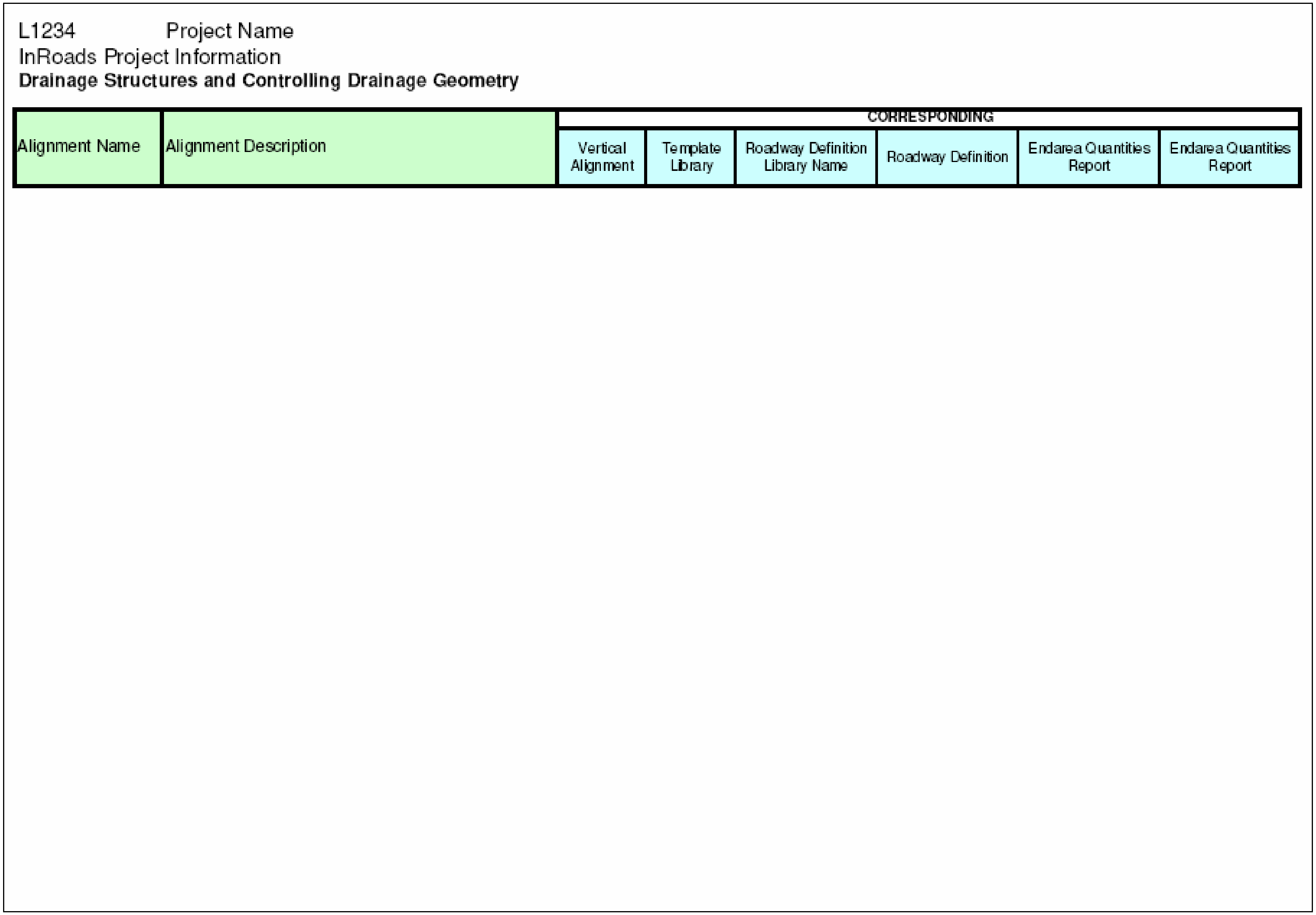
Geometry Project Name (ALG)	Alignment Name	Alignment Description	CORRESPONDING							
			Vertical Alignment	Superelevation	Template Library	Template Name	Roadway Definition Library Name	Roadway Definition	Endarea Quantities Report	Endarea Quantities Report - Walls

L1234 Project Name
InRoads Project Information
Digital Terrain Models (DTMs)

DTM Surface Name	Surface Description	Developed By	Narrative (Edits, Merges)

L1234 Project Name
InRoads Project Information
Survey Fieldbook

Fieldbook Name	Fieldbook Description	Surveyed By			CORRESPONDING		
		Name	Contact Number	Agency	Traverse Notes	Data Backup Location	Datum



L1234 Project Name

InRoads Project Information

Drainage Structures and Controlling Drainage Geometry

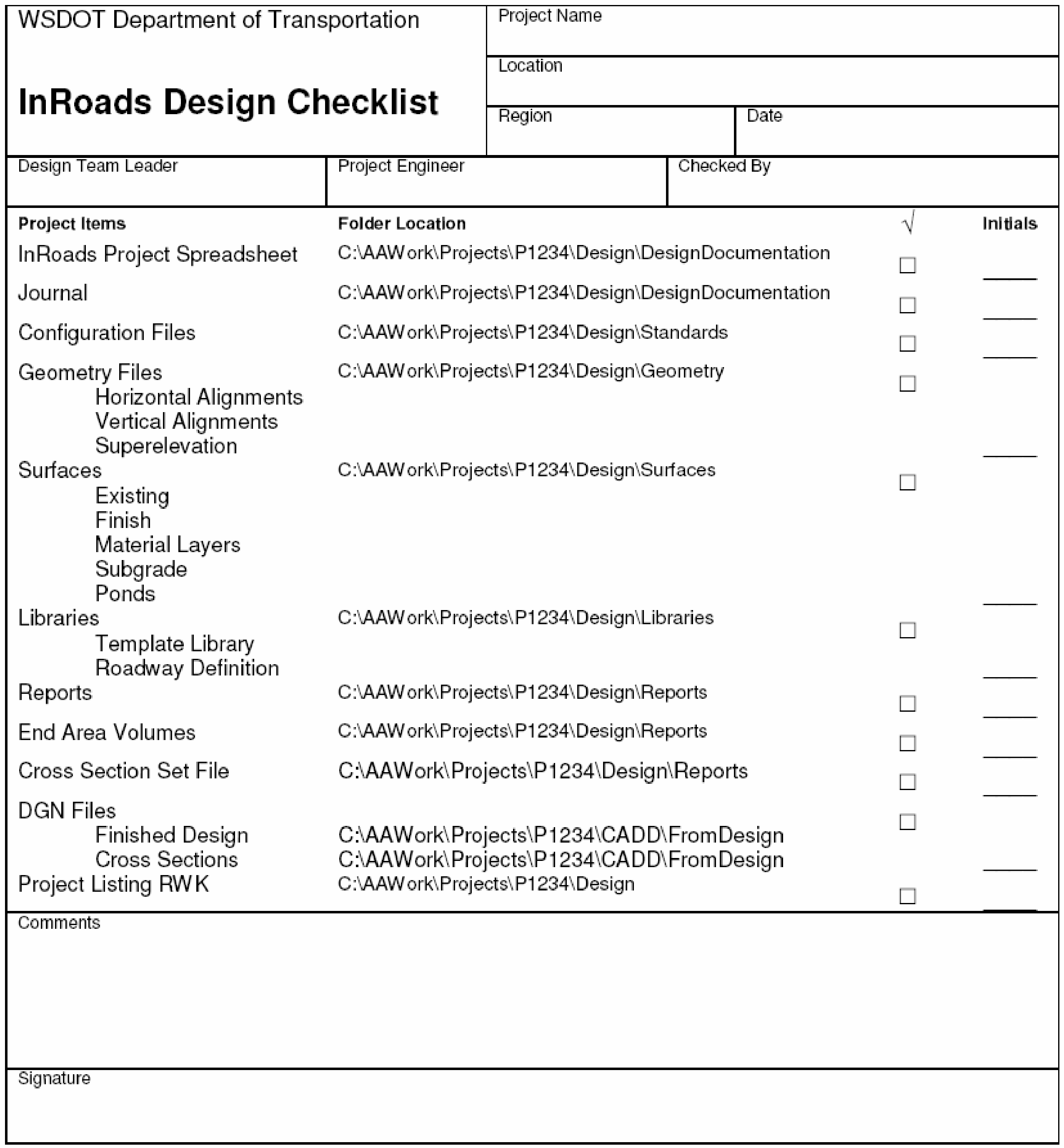
Alignment Name	Alignment Description	CORRESPONDING					
		Vertical Alignment	Template Library	Roadway Definition Library Name	Roadway Definition	Endarea Quantities Report	Endarea Quantities Report

L1234 Project Name
InRoads Project Information

Retaining Walls, Noise Walls, and other Structures

Alignment Name	Alignment Description	CORRESPONDING							
		Vertical Alignment	Superelevation	Template Library	Template Name	Roadway Definition Library	Roadway Definition	Endarea Quantities Report	Endarea Quantities Report - Wall

8.8 InRoads Designer Checklist



WSDOT Department of Transportation

InRoads Design Checklist

Project Name

Location

Region

Date

Design Team Leader

Project Engineer

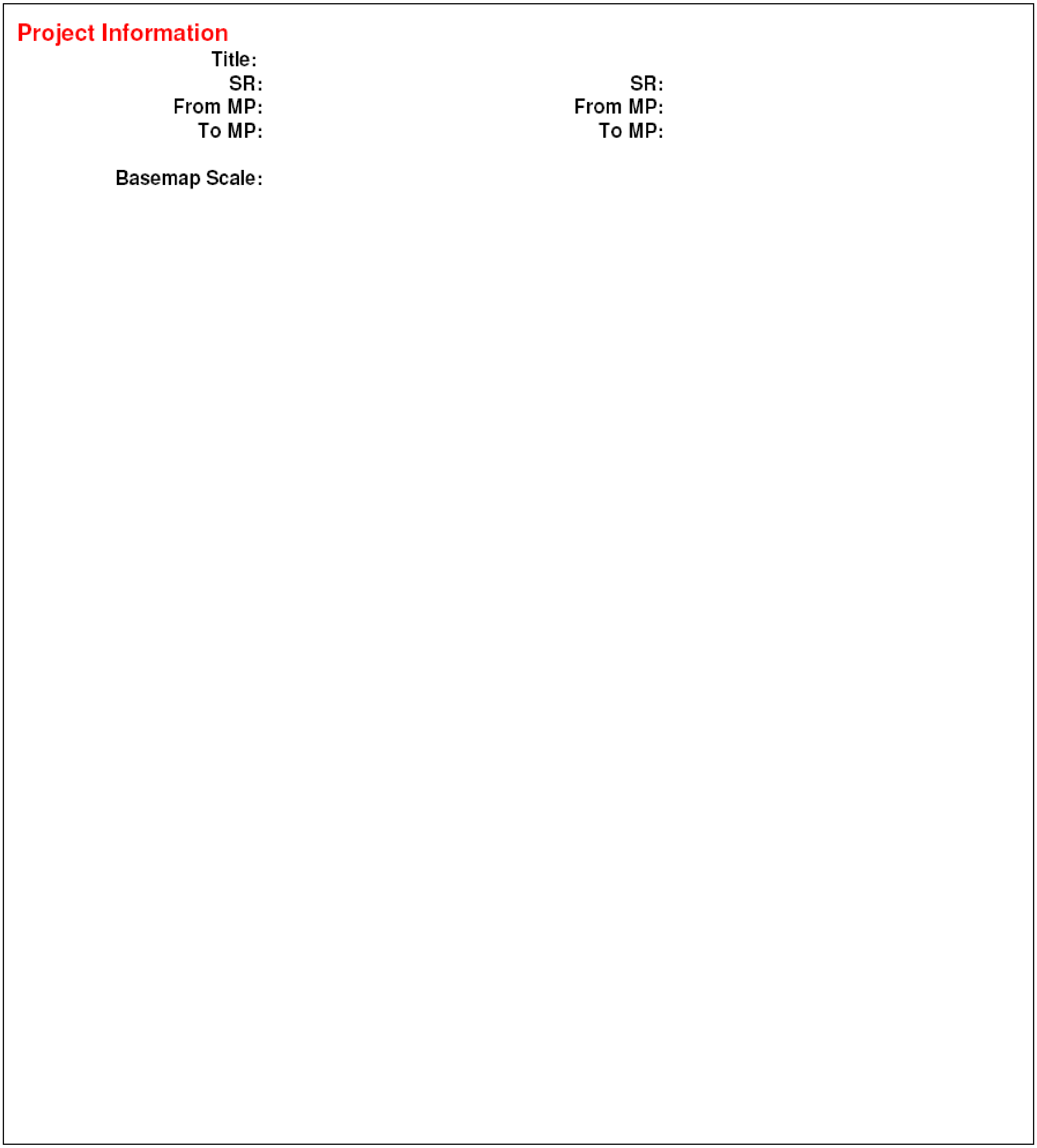
Checked By

Project Items	**Folder Location**	√	**Initials**
InRoads Project Spreadsheet	C:\AAWork\Projects\P1234\Design\DesignDocumentation	☐	_____
Journal	C:\AAWork\Projects\P1234\Design\DesignDocumentation	☐	_____
Configuration Files	C:\AAWork\Projects\P1234\Design\Standards	☐	_____
Geometry Files	C:\AAWork\Projects\P1234\Design\Geometry	☐	
Horizontal Alignments			
Vertical Alignments			
Superelevation			_____
Surfaces	C:\AAWork\Projects\P1234\Design\Surfaces	☐	
Existing			
Finish			
Material Layers			
Subgrade			
Ponds			_____
Libraries	C:\AAWork\Projects\P1234\Design\Libraries	☐	
Template Library			
Roadway Definition			_____
Reports	C:\AAWork\Projects\P1234\Design\Reports	☐	_____
End Area Volumes	C:\AAWork\Projects\P1234\Design\Reports	☐	_____
Cross Section Set File	C:\AAWork\Projects\P1234\Design\Reports	☐	_____
DGN Files		☐	
Finished Design	C:\AAWork\Projects\P1234\CADD\FromDesign		
Cross Sections	C:\AAWork\Projects\P1234\CADD\FromDesign		_____
Project Listing RWK	C:\AAWork\Projects\P1234\Design	☐	_____

Comments

Signature

8.9 PS&E Plan Set Project Documentation



Project Information

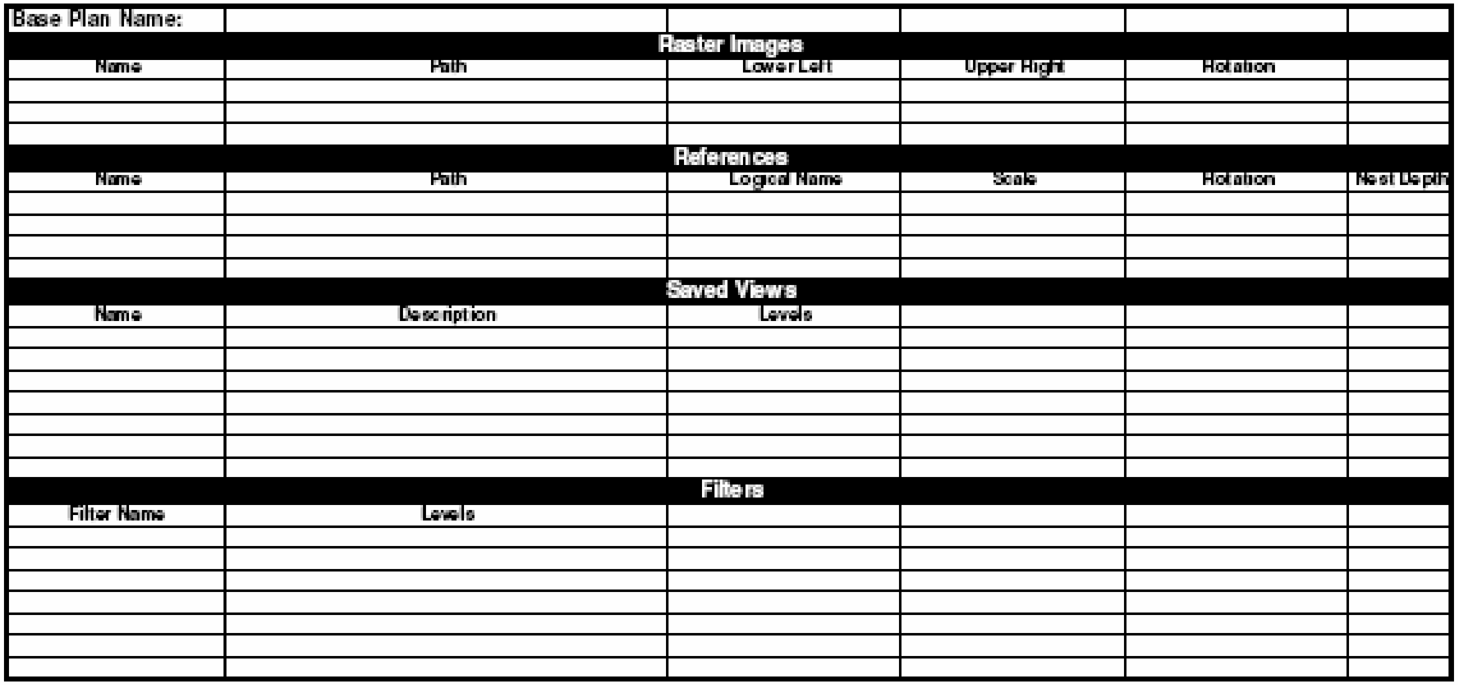
Title:

SR:
From MP:
To MP:

SR:
From MP:
To MP:

Basemap Scale:

8.10 PS&E Base Plan Documentation



Base Plan Name:					
Raster Images					
Name	Path	Lower Left	Upper Right	Rotation	
References					
Name	Path	Logical Name	Scale	Rotation	Nest Depth
Saved Views					
Name	Description	Levels			
Filters					
Filter Name	Levels				

8.11 PS&E Sheet File Documentation

General									
File Name		Plan Types in File	Sheet File Levels						
Sheet Information									
Sheet Location	SH Ref No	References	Path	Logical Name	Scale	Rot.	Nest Depth	Saved View	Filter
Saved Views									
Name		Description	Levels						
Filters									
Filter Name		Levels							